Proceedings of the Twenty-third Biennial Congress of the International Association of Empirical Aesthetics

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Edited by Aaron Kozbelt
Editor’s Introduction

This document represents the official proceedings of the twenty-third biennial Congress of the International Association of Empirical Aesthetics, held in New York City, at Hunter College of the City University of New York, from August 22 to 24, 2014. Well over 100 researchers, scholars, and artists representing a total of at least 24 countries participated, and these proceedings document approximately 160 separate contributions to the Congress. While maintaining many aspects of former IAEA Congresses, namely, numerous spoken papers and the art exhibition traditionally associated with the Congress, in this meeting we have tried to emphasize even greater scientific exchange, including multiple high-profile keynote addresses, awards addresses, and three symposia, as well as poster presentation sessions.

All accepted Congress submissions are included in these Proceedings. They are organized in four parts: Plenary Talks (including the Presidential address, keynote and award addresses, and symposia), Spoken Papers, Poster Presentations, and Art Exhibition. Submissions in the latter three parts are organized alphabetically by first author last name, rather than by session time at the Congress. There is some variability in the length and nature of the submissions, and some have been lightly edited, mainly to standardize formatting. This document consists only of the submissions themselves; as it is intended to be a searchable document, there is no separate index. We expect these proceedings to be permanently archived on the IAEA website, http://science-of-aesthetics.org, soon.

My most sincere and enthusiastic thanks to my valued friends and co-organizers, Paul Locher and Pablo Tinio, both of Montclair State University, who have been instrumental in helping to get this Congress together. Thanks also to Hunter College of the City University of New York, and especially Professor Virginia Valian, who played a key role in securing the Congress venue. Finally, thanks to the Leonard and Claire Tow Foundation, which provided some financial support for the Congress, through a Brooklyn College Fellowship.

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PART ONE: PLENARY TALKS

Presidential Address

Keynote Addresses

Fechner and Baumgarten Award Addresses

Symposia
  • Neuroaesthetics
  • Current Issues and Debates
  • Architecture
Presidential Address:
Characterizing Neuroaesthetics and its Critiques

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Abstract

Neuroaesthetics is poised to enter the scientific mainstream as evidenced by international meetings, special issues in journals, and the creation of dedicated specialized centers. The full force of neuroscience is probably not appreciated in so far as scientists working in perception, emotion, attention, semantics, and decision-making, are conducting research that could easily be considered neuroaesthetics but this work is not recognized as such. By contrast, aesthetics has long been a topic of scholarship within the humanities. Given the depth, richness and history of aesthetics inquiry in the humanities, it behooves neuroscientists entering this new field to converse with scholars in the humanities. Some prominent commentators from the humanities are critical of neuroaesthetics, but their critiques often treat neuroaesthetics as monolithic, underestimate the range of neuroscience, and take aim at wrong targets. For dialog across disciplines to be meaningful, we need to be clear about the topic under discussion. I propose that neuroaesthetics can take different forms: it can be depictive, descriptive, or experimental. Depictive neuroaesthetics refers to the visual depiction of neuroscience. Descriptive neuroaesthetics refers to observational and anecdotal studies. Experimental neuroaesthetics refers to experiments designed with controlled manipulation of variables of interest. Depictive neuroaesthetics communicates neuroscience information while being sensitive to the aesthetics of depiction. For example, Ramon y Cajal’s beautiful drawings of nerve cells as he developed the neuron doctrine are examples of aesthetic sensibilities harnessed in the service of understanding the brain. By contrast, depictions of neurons are being used currently as artwork. In this case, neuroscience is being used to create aesthetic experiences. Despite the surface similarity of both endeavors, nobody in the sciences or the humanities conflates one activity with the other. This distinction between neuroscience serving aesthetics and aesthetics serving neuroscience is also present in descriptive and experimental neuroaesthetics, but is typically not appreciated by humanitarians and neuroscientists. Many humanitarian critics of neuroaesthetics confuse studies designed to understand the brain with studies designed to understand aesthetics and many neuroscientists do not appreciate when their studies do not necessarily advance an understanding of aesthetics, per se.
Keynote Address:
Art, Emotion, and Evolution

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Abstract
As Tolstoy pointed out, art is a very expensive affair socially. What could possibly justify the sacrifice of the sometimes vast social and economic resources that have been dedicated to the production of art historically. Taking seriously the recurring association of art with the arousal of emotion, I try to argue that art's capacity to engender affective contagion provided a lever for fellow feeling and bonding among our ancestors enabling them to form larger and larger groups not based only on blood ties. Thus, art contributed to the group advantage of our forebears and, arguably, especially in the form of mass art, continues to do so into the present.
Keynote Address:
Empathy, Inhibition and Judgement

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Abstract
As empathy has become one of the growth areas in cognitive science, so too it has become fashionable in esthetics again. In this paper I discuss the relationship between empathy and detachment in judging a work of art. I give a number of striking examples of empathetic engagement works of art, propose that the notion of empathy be narrowed down more carefully than it usually is, and suggest some of the networks of inhibition that play a central role in the detachment of the self from its absorption into the represented other — or even into an abstract work. The basic problem will be that of understanding how such processes offer the necessary potential beyond empathy for self-awareness, contemplation and judgement.
Fechner Award Address:
Aesthetics in Action: Applied Research in Museums, Education, and Astronomy

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Abstract
I am honoured to be the recipient of the 2014 Gustav Fechner Award for lifetime contribution to the field of empirical aesthetics. My presentation briefly describes my research in empirical aesthetics in three areas: Aesthetics in Museums, Aesthetics in Education, and Aesthetics in Astronomy. I will describe some empirical designs and scales that were developed in my research, such as a variation of a crossover design and the Aesthetic Fluency scale; provide selected findings on how museum visitors look at art and how to vary museum labels both for accessibility and engagement; describe some expert/non-expert differences in viewing and perceiving works of art and deep space images; offer some results from research on creative teaching and assessment in the arts; and, discuss some perceptions and misperceptions of aesthetics in astronomy. Much of this research has been done in collaboration with my colleagues, and to them I am most appreciative.
Baumgarten Award Address

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(Abstract unavailable at press time.)
Baumgarten Award Address:  
A Search for the Biological Origins of Art  
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Abstract
The conviction that a comprehensive psychology of art requires an understanding of its biological origins was a fundamental pillar in Berlyne’s (1971) psychobiological aesthetics. Our knowledge of the neural and evolutionary foundations of art has increased substantially in the last decade, with dozens of neuroimaging studies, and many new archaeological findings. Here I review some of these advances, and examine their implications for the psychological study of art.

Keywords: art, aesthetics, neuroaesthetics, brain, evolution.

The Biological Approach to Art
I wrote my PhD thesis on the impact of visual complexity on aesthetic appreciation (Nadal, Munar, Marty, & Cela-Conde, 2010). Naturally, Berlyne’s work (1970, 1971) became my cornerstone. The learning experience was enormously gratifying, but, ultimately, I felt that my results were disconnected from the big picture. Even more troubling, I realized that I had no clue what the big picture was.

It only began coming into focus when, unsettled by the suspicion that my work was anachronic and conceptually severed from everything that mattered, I again read Berlyne’s (1971) Aesthetics and Psychobiology. This time I realized that its value resides not so much in the facts about methods and results I had previously turned to it for, but in the broad program it laid down. In the book’s first pages I found what I needed so much—meaning and purpose for my research:

“So the psychologist cannot feel that he has completed his work and explained a form of behavior until he has placed it in a biological perspective, which means relating it to natural selection and learning. Every form of behavior must depend on bodily structures, including characteristics of the human nervous system, that have appeared in the course of evolution because they could contribute to the survival of the individual and the species. This must hold for aesthetic activities as well as for any others, so that the psychological study of art must include a search for the biological origins of art” (Berlyne, 1971, p. 8, emphasis added).

Although this sounds quite reasonable, and maybe even trivial, a surprisingly large amount of psychological research on art has been—and still is—carried out without reference to biological considerations, whether neuroscientific or evolutionary. In any case, I had found a long-term research goal that I found appealing and challenging. Hoping to contribute to the development of a comprehensive psychological account of art production and appreciation, I aimed to understand how the cognitive and affective processes involved in art emerge from brain function, and the evolutionary history of this function.

It is only to easy to infer that this sort of research program assumes that the biological explanation is preferable, and that psychological explanation can be somehow reduced to it, or even done away with. This, however, is not the case. A biological approach “(...) does not make the psychologist a physiologist, for precisely the same reason that the physiologist need not become a cytologist or biochemist (...) the psychologist is interested in physiology to the extent that it contributes to his own task” (Hebb, 1949, p. xv, emphasis added).

Thus, as a psychologist, I am interested in how neuroscience and evolution can contribute to understanding the psychological mechanisms that allow us to produce and appreciate art. And they have much to contribute. In fact, the volume of research on the biological foundations of art has multiplied during the last decade (Cela-Conde, Agnati, Huston, Mora, & Nadal, 2011; Chatterjee, 2011a; Nadal & Pearce, 2011). An search for the term “neuroaesthetics” in Google Scholar or Web of Science reveals a dramatic increase over time in the number of publications that mention this term—for good or bad, I guess.

Indeed, this steady increase does not reflect the fact that research on the neural and evolutionary foundations of art is often received with suspicion and even hostility, or viewed just as inconsequential by humanists and scientists alike. This attitude is not new at all. Thomas Munro (1928) already realized that “any proposal to apply the methods of natural science to aesthetics is apt to be met with skepticism and indifference” (Munro, 1928, p. 14). This long lasting resistance reflects two equally long lasting misconceptions. One has to do with the belief that the biological approach is opposed to more traditional theoretical approaches to art; the other, with a misunderstanding about what we by “art”. Before moving on, we must briefly take look at these.

The Roots of the Biological Approach
Interest in the biological origins of art and aesthetics is by no means new. In fact, it has its roots in the writing of 18th century philosophers. The observation that aesthetic qualities and feelings play a crucial role in mate preference is a good
example. Darwin (1871/1998) is usually credited with the original attribution of this sort of biological function to art and aesthetics. However, a century and a half earlier, Joseph Addison (1712) had already made this connection, when reflecting on the sources of aesthetic pleasure:

“This we see that every different species of sensible creatures has its different notions of beauty, and that each of them is most affected with the beauties of its own kind. This is no where more remarkable than in birds of the same shape and proportion, where we often see the male determined in his courtship by the single grain or tincture of a feather, and never discovering any charms but in the colour of its species” (Addison, 1712, p. 36).

Thomas Reid (1785) also stressed this adaptive role of natural beauty: “There seem likewise to be varieties in the sense of beauty in the individuals of the same species, by which they are directed in the choice of a mate, and in the love and care of their offspring” (Reid, 1785, p. 744). Thus, Darwin’s (1871/1998) great accomplishment was to propose a natural mechanism—sexual selection—that explained these observations made by earlier British empiricist philosophers.

Even Berlyne’s (1971) conviction that a comprehensive understanding of art experience requires knowledge of the underlying physiology has its roots in the philosophy of the Enlightenment. Edmund Burke (1757) argued—along the lines Berlyne (1971) would later expand—that aesthetic experiences are grounded on the same physical mechanisms as non-aesthetic emotions. He deduced that beautiful objects produce the same relaxation of our nervous system as the emotion of love does, and that sublime objects have the characteristic effects of pain, fear, and terror on the nervous system. This approach was developed further by some of Burke’s contemporaries, and grounded some of the earliest psychological explanations of artistic and aesthetic appreciation (Allen, 1877; Marshall, 1894).

In terms of the big picture, thus, the search for the biological origins of art from the perspectives of neuroscience and evolution is not inherently opposed to philosophy or other theoretical approaches. It is actually an extension into the natural sciences of issues and questions that empiricist philosophers originally posed in the 18th century.

**What Art?**

The term “art”, as commonly used, does not refer to a natural class of objects or activities, and can mean many different things. This concept has been shaped and molded over many centuries and used in many and varied ways:

“The various arts are certainly as old as human civilization, but the manner in which we are accustomed to group them and to assign them a place in our scheme of life and culture is comparatively recent […] The branches of the arts all have their rise and decline, and even their birth and death, and the distinction between ‘major’ arts and their subdivisions is arbitrary and subject to change” (Kristeller, 1952, p. 45)

The set of activities we have learned to regard as art—the fine arts, for instance—have only been grouped together under the same label and awarded an elevated status since the mid-18th century. The aim of this grouping was actually to produce a system that would agree with the view that imitation and purposelessness were the essence of art (Shiner, 2001). Even today, it is commonly thought that painting, music, or sculpture share some essence that justifies including them in the category of art, while excluding, for instance, gardening or centerpiece arranging. But this notion of art is extraordinarily limited, both culturally and historically:

“We are accustomed to understand art to be only what we hear and see in theatres, concerts, and exhibitions; together with buildings, statues, poems, novels… But all this is but the smallest part of the art by which we communicate with each other in life. All human life is filled with works of art of every kind from cradle-song, jest, mimicry, the ornamentation of houses, dress and utensils, up to church services, buildings, monuments, and triumphal processions. It is all artistic activity.” (Tolstoy, 1904, p. 51).

Given its arbitrariness, and its cultural and historical contingency, the concept of art as Western fine art is inadequate if our goal is to characterize the biological origins of art. A broader approach is required; one that is grounded on the common features of art as practiced in different cultures and as part of people’s lives (Dissanayake, 1980, 1992). Anderson’s (2002) analysis suggests that, around the world, art (i) conveys culturally significant meaning, (ii) shows a characteristic style, (iii) is produced using a sensuous, affective medium, and (iv) involves the recognition of special skill. Accordingly, Anderson (2004, p. 277) has defined art as “culturally significant meaning, skillfully encoded in an affecting, sensuous medium”.

Danto’s (2013) similar definition of an artwork—based not on anthropological observation but on philosophical reasoning—as a work that skillfully embodies meaning, suggests that this description of our object of research is close to one many would agree on, at least in general terms. If it at least comes close to an adequate working characterization of art, then we can define the search for the biological origins of art as the attempt to identify the neural and evolutionary mechanisms that endow humans with the capacity to produce, but also understand, appreciate, and relate to culturally significant meaning skillfully embodied in affecting and sensuous media.

I feel, on the one hand, that this statement clearly describes the research goal. I fear, on the other, that it clearly shows just how far we are from attaining it. There is little doubt, however, that research performed in the last decade has brought us a long way to understanding the neural and evolutionary foundations of art—at least its appreciation.
The Neural Foundations of Art

Neuropsychological and neuroimaging studies are the two main research lines that have thrown light on the neural mechanisms underlying the creation and appreciation of art and aesthetics (Chatterjee, 2011). I will focus here on the latter. The short story is that there is no localized seat for art in the brain. Art appreciation is the result of complex feedforward and feedback interactions throughout a broadly distributed network of cortical and subcortical brain regions. None of these is specialized in responding to art. They are all involved in other facets of human cognition, from perception to abstract reasoning and morality (Zaidel & Nadal, 2011).

The slightly longer story is that neuroimaging studies converge on the notion that aesthetic appreciation is related to activity in three functionally distinct sets of regions (Chatterjee, 2003; Chatterjee & Vartanian, 2014; Nadal, 2013). One of these sets is the reward circuit. The appreciation of art relies on processes involved in reward representation, prediction and anticipation, affective self-monitoring, emotions, and the generation of pleasure, that take place in cortical (anterior cingulate, orbitofrontal, insular and ventromedial prefrontal) and subcortical (i.e., caudate nucleus, substantia nigra, and nucleus accumbens) regions, as well as some of the regulators of this circuit (i.e., amygdala, thalamus, and hippocampus; Flexas, Rossello-Mir, de Miguel, Nadal, & Munar, 2014; Kirk, Skov, Christensen, & Nygaard, 2009; Vartanian & Goel, 2004; Vartanian et al., 2013).

Art appreciation also involves an attention-related enhancement of activity in cortical regions related to sensory processing. These regions include the bilateral fusiform gyri, angular gyrus, and the superior parietal cortex in visual aesthetic experiences (Cela-Conde et al., 2009; Cupchik, Vartanian, Crawley, & Mikulis, 2009), primary and secondary auditory cortices during the appreciation of music (Brown, Martinez, & Parsons, 2004), and the extrastriate body area of the occipital cortex and the ventral premotor cortex during the appreciation of dance (Calvo-Merino, Urgesi, Orgs, Aglioti, & Hagbard, 2010).

Finally, art appreciation is also related to an increase in activity throughout a network of cortical regions involved in evaluative judgment, allocation of attentional resources, and retrieval of information from memory to contextualize the stimuli and judgment. This network includes the dorsolateral and ventrolateral prefrontal cortex, anterior medial prefrontal cortex, temporal pole, posterior cingulate cortex, and precuneus (Cupchik et al., 2009; Jacobsen, Schubotz, Höfel, & von Cramon, 2006).

Based on these foundations, the search of the neural underpinnings of art appreciation is now growing in two opposite but complementary directions. On the one hand, some studies have adopted an analytical approach, which aims to understand how activity in specific regions is modulated by certain factors, such as style or personal preferences. On the other hand, other studies have adopted a synthetic approach, aiming to understand how regions work together forming networks that bind the complex of processes involved in art appreciation together into a unique experience.

Adopting the analytical approach, Cattaneo et al. (2014a) used transcranial direct current stimulation (tDCS) to further test Cupchik and colleagues’ (2009) finding that the left prefrontal dorsolateral cortex (lDLPFC) underlies the adoption of an aesthetic orientation, understood as the deployment of processing resources towards aesthetic features of the stimulus (style, composition, balance, use of colour and line, and so on). This differs from a pragmatic orientation, that is to say, the common way in which images are approached, focusing mostly on the content depicted, in detriment of the aforementioned aesthetic features. Cattaneo et al.’s (2014a) results revealed that IPFDLC stimulation increased liking for visual stimuli. Interestingly, though, only for photographs and representational paintings, not abstract ones. The same stimulation, however, had no effect on colorfulness evaluations, suggesting that the stimulation did not bias general decision-making. Cattaneo et al. (2014) argued that the induced increase in IPFDLC activity led to an enhancement in aesthetic orientation towards representational stimuli, which, as predicted by Cupchik et al. (2009), increased individuals’ liking for art. But why only in the case of representational images? A follow-up transcranial magnetic stimulation study (Cattaneo et al., 2014b) showed that personal preference modulates the relation between IPFDLC activity and aesthetic appreciation. Specifically, activity in this brain region seems to be involved in orchestrating the cognitive and perceptual processes involved in appreciating the sort of artworks—whether abstract or representational—that are generally preferred.

Adopting the sort of synthetic approach noted above, and based on earlier work analysing whole brain activity in response to art (e.g. Munar et al., 2012), Cela-Conde and colleagues (2013) studied the functional neural networks underlying the aesthetic appreciation of visual stimuli. They measured phase synchronization and amplitude correlation among MEG sensors in three time frames: 500 ms before stimuli onset (baseline), between 250 and 750 ms after stimuli onset (early interval), and between 1000 and 1500 ms after stimuli onset (late interval). Their results suggest that, in relation to baseline, the early interval is characterized by heightened activity in a network of occipital brain regions, probably related to the enhancement of visual processing. The late interval, in comparison to the early one, sees the establishment of functional networks that link parietal and prefrontal regions, possibly reflecting an aesthetic orientation to the stimuli. Crucially, synchronization and correlation among prefrontal, parietal and occipital regions when participants viewed images they considered to be beautiful was significantly higher than when they viewed images they considered to be ugly. These results illustrate that, although it is valuable to understand the role of certain brain regions, what really enables art appreciation is the large-scale interactions among them.
The Evolutionary Foundations of Art

There are at least two sources of evidence that can be helpful in constraining hypotheses about the evolutionary origins of art: comparative neuroanatomy and archaeology (Nadal, Capó, Munar, Marty, & Cela-Conde, 2009). True, this evidence might never tell us how art appreciation evolved, but it has the potential to tell us how it did not.

Comparative neuroanatomy reveals striking structural and connectivity parallels between humans and other primates in the brain regions involved in art appreciation (Zaidel, Nadal, Flexas, & Munar, 2013). These commonalities refer to aspects of the cytoarchitecture and functions of the lateral, anterior, and orbital prefrontal cortices and the temporal poles; the cytoarchitecture of the precuneus; and the retinotopic organization of primary and secondary visual areas; as well as the representation of objects and the processing of symmetry. Such similarities suggest that these features have not changed substantially and were not under strong selective pressures during human evolution.

In contrast, other features of the neural underpinnings of art appreciation show clear evidence of having been modified during human evolution. Specifically, multimodal association cortices have enlarged; the connectivity between and within prefrontal regions has increased; prefrontal cortices seem to process information from a broader diversity of sensory modalities; the cytoarchitectural organization of the anterior cingulate cortex has been significantly reconfigured; the precuneus has expanded and grown in organizational complexity; the dorsal visual stream has been expanded and elaborated; and the basal ganglia have expanded, developed an increased internal regulation, and receive greater inputs from the orbitofrontal cortex and anterior cingulate cortex (see Nadal et al., 2009 and Zaidel et al., 2013 for references).

Even such a sketchy picture of the evolution of the brain regions involved in art appreciation allows drawing two main conclusions. First, the evolution of the neural underpinnings of art appreciation did not begin from scratch, nor, paradoxically, with the appearance of humans. The brain and cognitive system of the common ancestor of humans and chimpanzees provided the starting point. In fact, to a considerable extent, the neural architecture that was later recruited for the appreciation of art was already in place between 6 and 8 million years ago, when hominins first appeared, and long before the first archaeological indicators of artistic activities. Second, certain features appeared at some point during human evolution, after our lineage split from that of chimpanzees. Based on the evidence reviewed above, these evolutionary developments seem to have (i) increased our ancestors’ ability to elaborate information to produce abstract representations and symbols, which are not necessarily tied to sensory modalities or related with real entities, (ii) enhanced their capacity for supervision of information processing and conflict monitoring and resolution, (iii) improved their processing of visual spatial relations, (iv) and increased their ability for regulation and self-awareness of affective and emotional states.

Natural selection, thus, did not build art and aesthetics de novo. It used certain aspects of preexistent primate brain regions and networks involved in several perceptual, affective and cognitive processes, and modified others, to assemble the neural mechanisms to support the production and appreciation of art.

The archaeological record provides ample evidence indicating a gradual and prolonged emergence of the cognitive underpinnings of the arts, including early use of pigments, engraving traditions, the elaboration of personal ornaments, the production of music, and the manifestations of earlier or contemporaneous hominins to Homo sapiens (McBrearty & Brooks, 2000).

The use of pigments is quite common in the African archaeological record for the last 130,000 years (Marean et al., 2007). There is evidence, however, of intensive use of pigments at sites dated to 200,000 years before present (ybp). Ochre sought for the specific red hues it produced, which would indicate that it was part of an organized system of symbols, has been found in caves dated to 100,000-150,000 ybp in Israel and South Africa (Marean et al., 2007).

The identification of crisscross lines engraved on several pieces of red ochre in Blombos Cave, in South Africa, and dated to between 75,000 and 100,000 years ago revealed a tradition of engraving abstract geometric depictions on ochre (Henshilwood, d’Errico, & Watts, 2009). Blombos Cave has also yielded 70,000-year-old engravings on bone, and up to 270 fragments of about 60,000-year-old ostrich eggshells with parallel or crosshatched geometric engravings have appeared at other sites (Texier et al., 2010).

The earliest evidence for use of personal ornamentation comes from seashell beads found in South Africa and along the southern and eastern shores of the Mediterranean, dating from 153,000 ybp. They were deliberately selected for their large size, and wear patterns indicate they rubbed against thread, clothes or other beads, which in some cases had been colored, suggesting they had been strung and worn for prolonged periods, perhaps even on a daily basis (d’Errico, Vanhaeren, Bartond, Bouzouggar, Mienis, Richter, et al., 2009).

The earliest objects broadly accepted as musical instruments are two pipes constructed from swan bones dated to 36,800 years ago, and found at the site of Geissenklösterle, Germany. However, the site of Isturitz, in the Pyrenees, which seems to have been inhabited by large groups of people for several thousand years, has yielded 17 flute-like artifacts, constituting the largest known concentration of sound-producing objects. Some of these instruments have been deliberately worked, showing truncated ends, drilled and smoothed holes, and incised lines. The sophistication in the manufacture of these instruments suggests that Homo sapiens arrived in Europe with a well-established musical tradition, and that musical behavior involving voice and body had a long history prior to the manufacture of instruments (Conard, Malina, & Münzel, 2009).
The archaeological record, thus, tells the story of a slow and gradual accumulation of behaviors related with art and aesthetics. The capacities to create and appreciate art emerged together with new and complex forms of social, technological, and environmental cognition that characterize our species. Some of these aesthetic or artistic behaviors have their roots in the behavior of earlier hominins, as indicated by Neandertal’s symbolic use of ochre and seashells (Zilhão et al., 2010). But nothing like the pervasiveness of ornaments, pigment use, engraving, and musical instruments is associated with any other prior or contemporary hominin species.

**Conclusion**

What can we say about the biological origins of art? We know our experiences of art emerge from a complex network of brain regions, none of which are specific to this domain of human experience. They can be grouped within at least three functional sets, related to affective and emotional processing, evaluative judgment and attention-driven enhanced perceptual processing.

Humans share many of the features of these brain regions with our primate relatives, suggesting that we inherited them from distant common ancestors. Other features of these brain regions have been subjected to significant modifications throughout the hominin lineage. The challenge now is to explain why and how natural selection preserved some of the features of the brain regions that constitute the network underlying the appreciation of art and aesthetics and favored changes to others.

Because such brain regions are involved in many other domains, it is likely that some of the changes were not driven specifically due to the advantages conferred in the domains of art or aesthetics. In fact, artistic activities did not emerge in isolation. The archaeological evidence demonstrates that they appeared as part of a suit of behavioral indicators of modern symbolic human cognition, together with new technological developments, new forms of ecological exploitation, and long-range exchange networks. Moreover, the archaeological record indicates that different artistic and aesthetic activities appeared gradually at different times and places of our species’ evolution. The creative explosion evident in European Upper Paleolithic sites was the result of an accumulation of behaviors and traditions that had appeared much earlier, some maybe even before the appearance of our own species. Engraving, coloring and beading traditions appeared and disappeared owing to the impact of environmental and demographic factors (Mellars, 2009).

**References**


SYMPOSIUM ON NEUROAESTHETICS

The Role of the Orbitofrontal Cortex in Aesthetics and Affective Processes

Arthur P. Shimamura

What Can Conceptual Art Teach Neuroaesthetics?

Alexander Kranjec

Neurocognitive Psychology of Aesthetics: A Hamburg View

Thomas Jacobsen

Aesthetic Experience as an Integrative Brain State

Edward Vessel
The Role of the Orbitofrontal Cortex in Aesthetics and Affective Processes

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Abstract
The orbitofrontal cortex (OFC) has been linked to a variety of affective processes, including emotional evaluation, reward processing, and emotional regulation. With respect to neuroaesthetics, this brain region is particularly active when individuals rate artworks as beautiful. One way to view these various findings is to consider a common mechanism associated with OFC processing. Alternatively, it may be that different regions within the OFC serve qualitatively different functions. In this presentation, I review findings from neurological patients and neuroimaging studies as a way to characterize the role of the OFC region in aesthetic experiences.

Keywords: neuroaesthetics; emotional regulation; orbitofrontal cortex, neuroimaging.

Neuroaesthetics research has identified critical brain regions and circuits involved in the analysis and appreciation of art objects. One significant finding has been the role of the orbitofrontal cortex (OFC) during aesthetic evaluations of beauty (Ishizu & Zeki, 2011; Kawabata & Zeki, 2004). In such studies, the medial OFC is particularly active when individuals judge a painting as beautiful. Similarly, Blood and Zatorre (2001) found this region to be active when individuals listened to intensely pleasurable music. These findings are consistent with other studies in which individuals judge the aesthetics (e.g., attractiveness; beauty) of non-art objects, such as faces (O'Doherty et al., 2003) and geometric forms (Jacobsen, Schubotz, Hofel, & von Cramon, 2005).

Emotional Regulation
In the backdrop of these neuroaesthetic findings are investigations of the role of the OFC in affective processes, such as emotional regulation and reward evaluation. As exemplified by the hallmark neurological case of Phineas Gage (Harlow, 1848; Macmillan, 2000), patients with OFC lesions exhibit a marked impairment in emotional control, appearing to act out their feelings and desires without any consideration of the consequences of their actions. If they feel angry, they become aggressive, if they are sexually aroused, they may immediately act out their feelings. From these findings, it has been suggested that the OFC is critical for inhibiting or suppressing emotional responses, thus allowing us to evaluate the future consequences of our behaviors before they are enacted (Aron, Robbins, & Poldrack, 2014).

The emotional disregulation observed in patients with OFC lesions has its cognitive counterparts in patients with damage to other parts of the prefrontal cortex. As such, Shimamura (2000; 2008) proposed dynamic filtering theory to account for the various metacognitive or executive control processes impaired in patients with prefrontal damage. Considering the numerous feedforward and feedback circuits between the prefrontal cortex and many regions in the posterior cortex, it seems reasonable to suggest that prefrontal regions act to orchestrate or modulate activity and serve as a means of top-down control (see also Miller & Cohen, 2001). Rather than one over-arching controller supervising all forms of behavior, it is argued that different prefrontal regions act to control different mental functions. Support for the role of the OFC in controlling emotional responses has been found in studies of disinhibited electrophysiological and behavioral responses to aversive stimuli (shocks, abrupt sounds) in OFC patients (Goodkind, Gyurak, McCarthy, Miller, & Levenson, 2010; Rule, Shimamura, & Knight, 2003). Also, in fMRI analyses, this region is particularly active during the viewing of emotionally laden films when specifically asked to suppress feelings (Shimamura, Marian, & Haskins, 2013).

What happens when an artist incurs orbitofrontal damage? The life of the 19th century photographer Eadweard Muybridge offers some insight (Shimamura, 2002). Muybridge is known for his artistic and scientific application of photography to capture animals in motion. He was also an extraordinary landscape photographer and the inventor of one of the first motion picture projectors. Muybridge’s life was significantly affected when he was thrown from an out-of-control stagecoach and hit his head against a boulder. His brain injury led to emotional outbursts and aggressive behavior, as evidenced by the fact that Muybridge murdered his wife’s lover after finding out that the baby his wife bore was likely not his. During the murder trial, Muybridge’s lawyers entered a plea of insanity, using as evidence the brain injury incurred from his stagecoach accident. As with the case of Phineas Gage, Muybridge's friends and colleagues testified that prior to his accident he was a good businessman and pleasant in nature; but after the accident, he was irritable, eccentric, a risk-taker, and subject to emotional outbursts. The jury, however, did not accept the insanity plea, as Muybridge appeared sane and stable during his trial. Nevertheless, Muybridge was acquitted because members of the jury could not condemn him, as they would have done the same under similar circumstances.

It is interesting to speculate whether OFC damage actually enhanced Muybridge's creative abilities. One could suppose...
that disinhibited emotions act to heighten one’s creativity. Interestingly, Miller and colleagues have studied patients with orbitofrontal damage due to frontotemporal dementia (FTD). These patients develop a particular interest in creating art. One possibility is that FTD patients are less inclined to inhibit or suppress their emotions, and as a result become more expressive. Thus, it is not that orbitofrontal damage makes one more creative or more artistic in an aesthetic sense. Instead, individuals with orbitofrontal damage may be less inhibited in expressing their emotions overtly, as in the creation of art.

**Reward Processing**

In addition to assessments of beauty and emotional regulation, the OFC has been implicated in reward processing during emotionally laden decision making tasks (see Kringelbach, 2005; Noonan, Kolling, Walton, & Rushworth, 2012). For example, patients with OFC lesions fail to modify their behavior in response to negative feedback. In such cases, OFC patients appear to be guided by immediate hedonic values rather than evaluating accumulated feedback over many trials (Bechara, Tranel, Damasio, & Damasio, 1996; Fellows & Farah, 2005).

Single-cell recordings of OFC neurons in primate models have provided detailed analyses of OFC activity during reward processing (Kennerley, Behrens, & Wallis, 2011; Padoa-Schioppa & Assad, 2008). A variety of reward-based neuronal activity suggests a dynamic region involved in the valuation, learning, and integration of stimuli and responses during reward-based tasks (see Wallis, 2012). Some neurons code the magnitude of reward, some are involved in feedback processing, whereas others determine reward significance, such as the amount of time or effort required to gain rewards.

In neuroimaging studies, OFC activity is related to feedback processing as well as the magnitude of reward. Small et al., (2001), gave individuals pieces of chocolate until they were sated. OFC activity was initially high but was reduced to the degree that the individuals were sated. Thus, it was not the physical stimulus that modulated OFC activity, because the stimulus was the same across trials. Instead, it was the degree to which the stimulus was rewarding that modulated OFC activity. Other studies suggest that the medial and lateral OFC exhibit dissociable patterns of activity with respect to reward processing (see Klein-Flugge et al., 2012; Noonan et al., 2012). Whereas the medial OFC appears directly correlated with reward value and motivation, the lateral OFC is involved with cognitive evaluations associated with feedback regulation and updating.

**A Functional Analysis: The Bigger Picture**

As indicated by this brief review, the contribution of the OFC to aesthetics and affective processing is manifold and dynamic. In addition to assessments of artistic beauty, the OFC is involved in emotional suppression, feedback analysis, top-down control of arousing stimulus, reinforcement updating, inhibitory control, and affective decision making. To the extent of current neuroimaging methods, these processes appear to have overlapping activations within the medial OFC. Thus, activation in this region does not identify any single process, such as generating an "aesthetic" or "beauty" response. As suggested by Chatterjee, Thomas, Smith, and Aguirre (2009) in their fMRI analysis of facial beauty, the brain's response to attractiveness involves a distributed neural circuit that includes the OFC but also depends on other sensory-specific and sensory-general processes. As such, it is naïve to consider the OFC as the focal region that inspires or generates a beauty response.

It is not, however, irrational to begin with rather simple, straightforward suppositions—such as the OFC mediating aesthetic responses—and with further analyses begin to appreciate that localized mechanisms must participate together with other brain regions to elicit a complex behavior. Thus, a functional neuroaesthetic analysis may begin by "splitting" the brain into smaller units of operation, but with further investigations attempt to "lump" them as part of a distributed computational network that operate together. As neuroaesthetic research progresses, we must consider being both "splitters" and "lumpers."

The purpose of creating functional classifications—that is, whether to lump or split—is to develop ways to test the properties of neural circuits. The advantage of lumping structures is that it helps to characterize properties of a neural circuit as a working unit, just as one might characterize in a car the functional role of the engine and separate it from the role of the transmission system. For example, it may be useful (for an auto mechanic) to consider two automotive components as separable functioning units. Of course, each can be further split into subcomponents, and the border between the two is fuzzy. With respect to OFC and aesthetic responses, it is useful to consider (i.e., lump) them with respect to other OFC functions, such as emotional regulation and feedback analysis as well as to consider such responses as defining a unique neural circuit that includes the OFC but also other critical brain regions. More importantly, what is needed beyond the splitting and lumping of regional activity are theories that describe neural mechanisms that underlie these circuits. When a functional mechanism is outlined, stark classifications are less critical, as it is the functional properties of neural circuits that become important.

**References**


What Can Conceptual Art Teach Neuroaesthetics?

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Abstract
Both conceptual art and cognitive neuroscience are engaged in describing and visualizing facts about basic categories of mind (e.g., space, objects, language). While neuroaesthetics is by definition broadly concerned with the brain’s role in how we think about art, it has typically focused on perceptual preferences (“what is beauty?”). To cut deeper ontologically the field might consider exploring questions posed by the work of conceptual artists (“what is art?”). I discuss parallels in practice between conceptual art and cognitive neuroscience using artist Mel Bochner as a case study. Providing a point of entry for empirically dissociating the conceptual from the beautiful, a general methodology is described where participants judge objects for higher-order qualities beyond beauty, including function, and art-objecthood.

Keywords: neuroaesthetics, conceptual art

Introduction
While the term aesthetics broadly refers to the general study of how we produce, perceive, and think about art, neuroaesthetics more specifically investigates the brain’s role in such processes (Chatterjee, 2011). Despite the wide scope of questions relevant to the larger field of aesthetics, scientific investigations in neuroaesthetics tend to focus on artistic preferences for particular visual attributes (Cela-Conde, Agnati, Huston, Mora, & Nadal, 2011; Nadal, Munar, Capo, Rossello, & Cela-Conde, 2008; Vartanian & Goel, 2004). Neuroimaging (in particular fMRI) studies typically engage participants in tasks that require making preference judgments concerning the beauty of a visual work of art (e.g., a painting) or visual object (e.g., a face). The aim of such studies is to reveal visual qualities that humans find universally appealing (e.g., those related to color, form, or spatial arrangement) in order to demonstrate how common aesthetic preferences may be related to the predisposed neural structure of perceptual systems. Put simply, such fMRI studies look at brain areas that become active when participants favorably respond to certain kinds of visual images. As such, these extant studies have addressed the larger philosophical question of “What is beauty (in the brain)?” by revealing neural structures associated with aesthetic preferences for general kinds of visual attributes.

While such research has provided valuable insight into the neural bases for aesthetic preference, research in neuroaesthetics need not be limited. Beyond beauty, a more fundamental question might ask: “What is art (in the brain)?”

Understanding how the brain responds to art as such is an important unanswered question in neuroaesthetics. As the modern history of art has taught us, and a recent theoretical critique of neuroaesthetics has more recently pointed out (Conway & Rehding, 2013) art need not be “beautiful” to be appreciated as art. To move beyond the beautiful, neuroaesthetics might more deeply consider so-called “conceptual art.”

Indeed, a distinguishing feature of conceptual art (understood here as a kind of art with some identifiable characteristics, rather than a particular work of art connected to a formal historical movement) is that it would seem to not be primarily concerned with the beautiful. But what is conceptual art really? Unsurprisingly, conceptual art is difficult to pin down. Goldie and Schellekens (2013) provide a set of common sense criteria to distinguish conceptual art from more traditional art. Generally, they understand conceptual art as being self-reflective and ironic, against medium and beauty, and “dematerialized.” That is, conceptual art frequently interrogates traditional ideas of what art is by playfully challenging standards of beauty and medium to the point that much of what constitutes a work of conceptual art is the idea itself. Or, to spin this notion of dematerialized art another way and quote Mel Bochner (Kranjec, 2013), “thought is a material.” Invoking some well-known examples, one can imagine how Duchamp’s famous urinal (Fountain, 1917) or Warhol’s commercial replications (e.g., Brillo Boxes, 1964) satisfy each of Goldie and Schellekens’ criteria.

So what can conceptual art teach neuroaesthetics? A close examination of conceptual art could help guide neuroaesthetics into new territory. And more broadly, beyond aesthetics, conceptual art has the potential to illuminate generalities about mental structure itself. While conceptual artists and neuroscientists use very different methods, they share some common ground. Like neuroscientists, conceptual artists often set out to visualize cognitive structure adopting an approach that can be described as systematic or analytic. In describing, abstracting, and visualizing facts about basic categories of mind and experience, conceptual artists are experts in reducing a concept or function to its most basic properties via an analysis of previous art and thought, and a consideration of human phenomenology. A cognitive neuroscientist might be said to engage in something like this when doing empirical research. In designing a study, all scientists build off previous findings. But cognitive neuroscientists, when using fMRI methods in particular,
engage in a kind of conceptual analysis that can mirror the process of the conceptual artist. For example, when considering the distinction between an experimental task (what a participant is doing) and a cognitive function (what mental processes are engaged), or utilizing cognitive subtraction techniques in designing an experiment, the neuroscientist performs a kind of conceptual reduction that takes into account subtle physical, perceptual, and/or phenomenological differences between stimuli, conditions, and concepts. Once the data are collected, decisions are made about how to best visualize the results (e.g., squiggles, bars, or blobs?). At the end of this process is a physical representation of a thought.

A deeper consideration of conceptual art may push neuroaesthetics forward theoretically. Empirical investigations in aesthetics typically focus on perceptual preferences for visual art (i.e., “what is beauty”). Ontologically, conceptual art often goes deeper than this (e.g., “what is art?”) in a manner that shares features of scientific inquiry. This is not to suggest that neuroaesthetics is more limited, but only that it is a much younger discipline as compared to conceptual art. Rather than thinking as “some people might...that conceptual art distracts scientists from getting to the very essence of art” (p. 149 Chatterjee, 2013), I believe conceptual art has the potential to serve as a guide for neuroaesthetics because both are frequently aimed at the same targets. However, the “parallelism” (Chatterjee, 2011) that exists between cognitive neuroscience and conceptual art is of a higher order than what has been previously described. In neuroaesthetics, a kind of first-order parallelism rests on the supposition that “the goals of the nervous system and of artists are similar. Both are driven to understand essential visual attributes of the world” (p. 153 Chatterjee, 2011). Zeki’s groundbreaking work (Zeki, 1999) argued that, as experts in visual representation, artists discovered organizing principles of visual perception long before empirical scientists. Experimental fMRI research using this general framework tends to explore automatic neural responses to physical differences in stimulus features across conditions. (E.g. “IS X BEAUTIFUL?” vs. “IS Y BEAUTIFUL?”)

A second-order parallelism, or “meta-parallelism” might be said to exist between conceptual art and cognitive neuroscience. By meta-parallelism I mean that the second-order reflective goals of the conceptual artist and cognitive neuroscientist are similar, in a way that goes beyond the first-order reflexive goals of the artist and nervous system. Like conceptual artists, cognitive neuroscientists studying aesthetics are more likely to interrogate beliefs about beauty, art, and thought. Both use systematic approaches to explore, and concretely depict the mental world. Experimental neuroesthetic research based on second-order parallelism could explore the neural responses when the kind of judgment differs between conditions while stimulus features within are kept constant. (E.g. “IS X BEAUTIFUL?” vs. “IS X ART?”)

In this paper I discuss ways that neuroaesthetics might benefit from a deeper consideration of conceptual art. First, as an example of the meta-parallelism described above, I review a case study comparing an artist (Mel Bochner) and a neuroscientist (myself). Second, I suggest a general approach for neurally dissociating distinct kinds of reflective aesthetic judgments. These distinct kinds of aesthetic judgments are suggested by themes first raised by conceptual art that now inform folk notions of the aesthetic experience.

Concepts in Art and Neuroscience: A Case Study in Space

Mel Bochner is a New York City artist who, despite disliking the term “conceptual art,” is sometimes credited with staging the world’s first conceptual art exhibition in 1966 (Bochner, 2008). I first became aware of Mel Bochner’s art while visiting the National Gallery of Art in the summer of 2012. Theory of Boundaries (then on display, see Fig. 1C) resembled stimuli from a set of studies I had recently completed exploring spatial representation in stroke patients (Amorapanth et al., 2012; Kranjec, Ianni, & Chatterjee, 2013). (See Fig. 2 below.) From this point, I found myself becoming a quick student of Bochner’s work. Initially attracted to Bochner’s general interests in language and space, I noticed more fine-grained areas of overlap between his interests and my own. For example, Bochner’s work appeared to recognize a well known neuropsychological distinction between categorical and coordinate spatial information (e.g., the difference between understanding that a shoe is “below the table” versus “30 inches from the table”), another topic that I had been recently investigating experimentally (Kranjec, Lupyan, & Chatterjee, 2014). Yet more than anything else, it was Bochner’s preoccupation with prepositions as a window into the structure of thought that seemed most remarkable to me, as was his tendency to depict equivalent spatial concepts in verbal and nonverbal formats. By providing an opportunity to reflect on the meanings of basic spatial relations while moving between words and images intended to express a common concept, Bochner’s art was intended to create an opportunity for viewers to experience the limitations of a particular kind of representation. His work in this respect owes something to “The Treachery of Images” by Rene Magritte who famously painted “Ceci n’est pas une pipe” beneath a picture of a pipe.
Bochner’s work during this period contrasts to the metric relations depicted in his Measurement works, in Theory of Boundaries word-image relations are explicitly ambiguous. Bochner’s work during this period seems to recognize the distinction between categorical and coordinate spatial information. Kosslyn (1987) originally proposed a hemispheric bias for processing two types of spatial information. Categorical relations refer to discrete spatial relations frequently lexicalized by locative prepositions like above, below and, in. Coordinate relations are finer-grained metric relations not as readily coded by language, usually involving distance information. Categorical representations specify abstract, equivalent (but perceptually ambiguous) classes of spatial relations and are preferentially processed in the left hemisphere, whereas coordinate representations specify the exact locations of objects in space, information important for reaching and navigation and processed in the right hemisphere. Recent work investigated relations between named categories and perceptual biases for categorical and coordination relations (Kranjec, et al., 2014). How language interacts with these two kinds of spatial relations is of interest to Bochner and neuroscientists like Kosslyn.

Bochner desired to create art “that did not add anything to the furniture of the world” in part as a response to an art world “dominated by the equation ‘art = objects’” as promoted by a pop artist like Andy Warhol or minimalist like Donald Judd (Field, 1996). Instead of creating art objects that people could take home, Bochner provided his audience with a kind of mental tool kit. That is, he sought to make art that compelled viewers to attend to, and reflect on, the most basic cognitive processes involved in seeing the structural relations between objects.

By focusing on relational concepts rather than objects themselves, Bochner moves away from the “furniture of the world” and closer to “the stuff of thought” (Pinker, 2007). The very thing that cognitive neuroscience aims to do by concentrating research on abstract categories like space, time, and number. That is to say, recent empirical research in cognitive neuroscience has also moved beyond a neuroscience of objects. Early imaging studies frequently sought to map where we process things like faces, words, and tools in the brain. Although this work is important and continues, interest in how we process basic abstract categories like space, time, number, and causality has increased, as the systems that subserve these relational processes have come to be understood as particularly important and potentially interrelated (Walsh, 2003). Broadly, one can see a parallel in how concepts are taken up by conceptual art and neuroscience. There is a trajectory from the concrete to the abstract; from things to relations.

Why is relational thinking so important, and what does space have to do with it? Consider the semantics of space. On the face of it, the language of space, namely prepositions, may seem relatively insignificant. Yet the simple meanings of spatial words present an opportunity to investigate the structure of a distributed semantic system in very stark form. Locative prepositions represent a closed set of frequently used spatial categories used across languages, with meanings constrained by perception and ecology. The meanings of basic spatial categories also serve as a foundation upon which more complex concepts are built; we think and talk about more abstract conceptual categories like emotions and morality using the language and structure of space. (E.g., “I’m feeling high/low.”) Prepositions are special because they are semantically and grammatically flexible in a manner that is unique in human language. By investigating how these particularly flexible, ambiguous, and productive units of language are represented in the brain along a semantic-syntactic continuum we may step closer to both delineating aspects of language that utilize neural structures evolved for perception and action, and those that make human language distinct from non-human forms of mental representation and communication. The deployment of basic relational language (using prepositions), grounded in fundamentally relational cognitive domains (like space), may make species-specific human abilities like analogy and metaphor possible (Gentner, 2003; Lakoff & Johnson, 1999).

By focusing particularly on the spatial relations between objects, Bochner’s art addresses not only deep questions regarding the meaning of art and art objecthood, but topics of more general interest to cognitive scientists. For cognitive neuroscientists, understanding how the neural organization of spatial perception is related to the ways in which we talk
about space in terms of prepositions can shed light on the nature of the intermediate representations that link distinct formats (like images and words) and domains (like space and time). Using lesion methods in patients, previous work that I have been involved with has investigated such intermediary structures between perception and language, in a graded model of mental representation (See Fig. 2).

Figure 2. Example stimuli from Kranjec et al. 2013.

For cognitive neuroscientists, describing the structures of “thought” at such an intermediate level can be difficult. When doing so, not only must one develop a verbal vocabulary to unpack complex concepts that can bridge definitions of mind and brain but, perhaps more than in other fields, cognitive neuroscientists are frequently required to interpret and develop visual vocabularies and metaphors to further explain novel imaging methods, materials, results, and models.

While much of Bochner’s early work is preoccupied with visualizing thought across formats (See Fig. 3), it also reveals an interest in the limits of representation more generally. In Misunderstandings (A Theory of Photography) (1969), Bochner presents us with notecards (Fig 4A-C) depicting several quotations about photography from artists, philosophers, and scientists. Yet three of the quotations are false quotes actually written by Bochner himself. General knowledge of this forgery (without knowing which specific quotations are real or fake) naturally raises questions about the truth of all the text presented. The work ironically uses language to demonstrate that we cannot always trust our eyes when viewing pictures. Text can be forged and pictures can be manipulated; no format represents an objective representation of reality.

Figure 3. Prepositional Sculpture (1970). Prepositional Sculpture illustrates Bochner’s interest in the verbal labeling of spatial relations in a relatively direct manner. In this case, the representational link between word and percept is made explicit such that the tape’s analog position describes the spatial relation coded by the verbal label printed on the tape (beside, between, over, under). A recent study using voxel based lesion symptom mapping (Amorapanth, et al., 2012) found evidence suggesting that discrete verbal and perceptual representations of such categorical spatial relations show a hemispheric bias.

Figure 4. (A-C) Misunderstandings (A Theory of Photography) (1969) and (D) results from Bennett et al. 2009.

As Roskies (2007) has pointed out, functional brain images are easily misunderstood as photographs of brain function by non-scientists. While neuroimaging allows for the visualization of nonvisual neural processes, most neuroscientists appreciate that the images produced by fMRI are not photographs of the brain. However, experts need to be reminded about the amount of interpretation, arbitrary decision-making, and statistical error that frequently contribute to images of brain function. Perhaps nowhere is this better illustrated than in Bennett, Miller and Wolford’s (2009) notorious study that found spurious brain activation in a dead fish (Fig. 4D). This empirical study is as close to a work of conceptual art as cognitive neuroscience gets (and may even satisfy Goldie and Schellekens’ criteria described above). Like Bochner’s postcards it uses a visual joke to install general doubt about images we might otherwise take for granted.
Investigating the Conceptual in Art Using Empirical Methods

In a recent book on neuroaesthetics Chatterjee (2013) writes, “to my knowledge there has not been any serious attempt to think about the science of conceptual art” (p. 147). This lack owes in part to conceptual art’s emphasis on meaning (vs. sensation or emotion), and the inherent limitations of experimental approaches not well suited to unpacking the complex layers of intent and reference that define most works of conceptual art. Whereas it is conceivable to imagine a science of conceptual art that investigates individual differences in perceptual or neural responses between experts and novices (when viewing a work like Duchamp’s Fountain, for example) it is not clear how one might design a study that disentangles the complex network of meaning contained within an individual work of art. To do so, continuing with our example, participants would presumably need to know something about why Duchamp chose a common object like a urinal for entry in an art exhibition — that it was intended as a challenge to current notions of art-objecthood, beauty, and so on. From here, the scientist would need to design tasks and use measures sensitive enough to record distinct responses to judgments about these complex kinds of understanding. The same methods would need to be extended to other conceptual artworks in order to collect generalizable data. It is not clear how this would be done.

To create a neuroscience of conceptual art that begins to address the organized network of meaning contained within an individual work of art we need to set the agenda much as the first conceptual artists did. Empirical approaches will need to (1) broaden the scope of objects that tend to be included in aesthetic research and (2) focus on the general processes and ideas associated with conceptual art rather than their specific products.

This means that the concerns of such research should not be limited to the context of the modern and contemporary high art world. The production of art has spanned human history and proliferated across the globe, yet throughout this process “art” objects have been created alongside more common, and often utilitarian, material culture objects. It is impossible to reduce the definition of art to one particular defining characteristic or motivation, but understanding that experiencing intentionally-crafted art objects involves both perceived form and conceptualized content provides a basis by which “art” can be discerned as distinct from more mundane material objects. As one scholar has written, shaping an “art” object involves taking something out of its everyday context and somehow making it “special” (Dissanayake, 1992). According to this view, art is an adaptation and, as a species-specific imperative, a normal part of what it means to be human (like talking, playing, and socializing). According to Dissanayake, art traditionally “makes special” those objects and activities that are critical for survival. For example, objects like utensils and clothing, and activities like marriage and death are enhanced by art across all cultures. Such enhancement has the adaptive function of acknowledging the realities of survival, while making them more pleasurable and less mundane. A neuroaesthetics of conceptual art could aim first at revealing the brain structures associated with processing such special objects. In this manner we may better understand how an object becomes construed and perceived as art by the observer. From here, we can begin to understand the neural processes at work when identifying, perceiving, and analyzing an object as a work of art— even when there are not necessarily distinctive visual qualities of the work that might separate this “art” object from a more common counterpart.

Furthermore, creating a neuroscience of conceptual art will mean returning to those artists who set the agenda for conceptual art. As already suggested, artists like Duchamp and Warhol were able to transform mundane objects into art by injecting them with artistic intent. A good point of entry for empirical investigations of conceptual art might be to try to understand how the human mind distinguishes between “art” and other objects. What does it take for an object to be perceived as art in the mind of a human being? Is it a set of formal attributes like shape, pattern, or color? Or is the distinction triggered by a particular stance an observer takes when responding to objects in a specific physical, functional, or social context, such as encountering an object in a museum, kitchen, or religious ceremony? If both aspects are involved in the recognition and mental representation of art objects, does the brain distinguish between them, and if so, which neural structures are associated with these theoretically distinct cognitive processes? Future studies using fMRI could explore the extent to which the difference between a special “art object” and an ordinary or “mundane object” is meaningful at the neural level. Specifically, using fMRI one could investigate whether the neural bases for conceptualizing artistic intent, and perceiving artistic features, can be dissociated during object processing. In the cognitive neurosciences much is known about “normal” object processing in terms of form, naming, and function. Yet how object processing may differ when participants search for “special” artistic intent is unknown.

A neuroaesthetics of object processing might begin by selecting a normal set of everyday objects like chairs. Chairs and other kinds of artifacts have a naturally ambiguous status as art objects. This is useful, because whereas some level of expertise may be required in evaluating Duchamp’s Fountain (another piece of material culture with ambiguous ontological status as art), everyone is an expert of sorts at recognizing and evaluating chairs. To move beyond beauty and towards the conceptual, a preliminary investigation could consist of rating chairs with respect to their form and function (Fig. 5).
Form (or beauty) and function (or content) are two foundational elements when considering any work of art. As compared to paintings, these attributes are relatively easy to disentangle in an object class like chairs. Other basic rating data regarding prototypicality, material value, and creative merit may also be of interest. From this point of entry, neural data involving higher-order ontological evaluations approaching the kinds questions posed by conceptual artists can be investigated using fMRI. For example, differences in neural processing while participants evaluate the ontological status of everyday objects as art (“Is it art?”) can be contrasted with evaluations for comfort, stability, and durability (“Is it functional?”) and form (“Is it beautiful?”). The cognitive neuroscientist can create conditions that isolate basic concepts and processes in non-art experts relevant to the most fundamental questions of aesthetics—beyond beauty and pleasure—in an attempt to mirror the thought of the early conceptual artists. (As the conceptual artist Donald Judd (1969) said, “If someone calls it art, it’s art.”) And if “thought is a material” it may be more productive to investigate the processes not the products of conceptual art, an approach that differs from that suggested by Minissale (2012). Rather than attempting to map the vast neural network involved in interpreting specific, semantically complex works of conceptual art, neuroscientists might begin to think more like conceptual artists. This way we can design experiments that allow participants to think conceptually about art as well, but in a relatively constrained manner. This can be done by reducing conceptual and phenomenological complexity: what many scientists and conceptual artists do best.

References


Neurocognitive Psychology of Aesthetics: A Hamburg View

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Abstract

The presentation in the Neuroaesthetics symposium will feature an overview of our recent empirical and theoretical work.

Keywords: Neuroaesthetics, neuro-cognitive Psychology of Aesthetics, music

In my presentation, I will report a number of our studies in Neuroaesthetics, the neuro-cognitive psychology of aesthetics, which focuses on the neurobiological underpinnings of aesthetic processing. Other vantage points on the aesthetic episode, situational, personal, evolutionary, historical etc., will be mentioned (Jacobsen, 2006). It is the perspectives of mind and body, following the Fechnerian tradition of the pragmatic dualism of Psychophysics, that will mainly be taken. In particular, I will present a neurocognitive model of the aesthetic appreciation of music, recently proposed by Brattico, Bogert and Jacobsen (2013), and a number of studies recently documented, e.g. work on musical taste (Istók et al., 2013).

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References


Aesthetic Experience as an Integrative Brain State

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Abstract
Understanding the cognitive and psychological processes that comprise aesthetic experience can be aided by studying its neural basis. Here, we propose that aesthetic experience is an integrative mode of processing that connects sensory experiences with internally directed thought processes, and that serves to facilitate knowledge acquisition. In contrast to reinforcement learning mechanisms that produce pleasure in response to specific associations, pleasure from many sensory experiences are tied to the extraction of meaning, and represent instances of “unsupervised” reward signals in the absence of association with primary reinforcers. Aesthetic appreciation reflects a subset of such experiences and involves integration of signals across multiple brain systems. In particular, rare instances of coactivation of sensory pathways and the default-mode network, which supports aspects of internally relevant mentation, may be a hallmark of aesthetic appreciation.

Keywords: neuroscience, aesthetic experience, pleasure, visual artwork, scenes, meaning, knowledge acquisition, default-mode network

Introduction
A consistent aspect of the behavior of all animals is the ability to learn associations between certain sensory events and primary reinforcers that produce pleasure, such as water or tastes or touch. Depending on the complexity of the nervous system, the range of patterns that can be associated with such pleasures are almost limitless. Humans, however, engage with stimuli that do not have any immediate survival value, nor have ever been associated with survival value, and are capable of deriving pleasure from these interactions. A subset of these interactions may be described as aesthetic experiences – interactions with art, music and performance, as well as interactions with objects where the goal is not to acquire, use, or “consume” in the conventional sense, but to appreciate (and “consume” in the informational sense).

Although the neuroscientific study of aesthetic experiences has increased dramatically in the past decade, our understanding of how brain states support aesthetic appreciation and judgment is still poorly understood. There is converging evidence pointing to the central involvement of several brain regions in aesthetic appreciation (e.g. portions of the orbitofrontal and medial-prefrontal cortices, Cela-Conde et al., 2004; Ishizu & Zeki, 2011; Jacobsen, Schubotz, Höfel, & Cramon, 2006; Kawabata & Zeki, 2004; Kirk, Skov, Christensen, & Nygaard, 2008; Vartanian & Goel, 2004), and it is generally known that aesthetic experiences involve brain systems supporting perception, affect/emotion and (in the case of aesthetic judgments) decision making. Yet until recently, there has been little indication as to what is special about brain states that one may refer to as “aesthetic.”

Below, I propose the outlines of an answer to this question. Importantly, this proposal takes the form of a cognitive and neural theory, rather than a psychological theory. In the process, this effort may also shed light on what an understanding of the neuroscience of aesthetics can tell us about what an aesthetic experience is, and how aesthetic appreciation is computed.

The framework presented herein conceptualizes aesthetics as about more than mere “sensation” or surface properties. On the contrary, aesthetic experience, appreciation and judgment encapsulate an integrative mode of processing an object or event that is in the service of long-term epistemic learning, knowledge acquisition and understanding, and is intimately connected with self-referential, internally directed thought. This stands in contrast with other, similar processes that aid in immediate action selection, such as the evaluation of the expected values of potential outcomes during choice behavior.

Before proceeding, it will be helpful to distinguish the related concepts of pleasure, preference, and aesthetic experience. Pleasure refers to the hedonic liking that is experienced during the act of consumption. Preference, in this context, refers to the outcome of a set of (typically explicit) judgments that one stimulus is liked more than another; measuring preferences is therefore also a behavioral method for assessing the underlying pleasure that a person experiences, though there are a number of assumptions that must be made about an observer’s ability to assess internal states when using preferences as a measure of pleasure. Finally, an aesthetic experience is the brain and body response that a person has when they engage with an aesthetic object, and includes states that one might refer to as beauty, sublimity, awe, wonder, and even “aesthetic” horror (plus others not enumerated here). Aesthetic pleasure, then, refers to the hedonic pleasure felt during an aesthetic experience, and I will use the phrase aesthetic appreciation to refer to the emotionally “moving” nature of aesthetic experiences, regardless of their precise form. For example, pastoral, “pretty” paintings (e.g. Van Gogh’s Irises), as well as dark, terrifying works (e.g. Picasso’s Guernica) have the capacity to strongly move a person, even though the emotional tone of these two aesthetic experiences are vastly different.

It is important to note that while aesthetic experience and appreciation involve aspects of pleasure and valuation, understanding reward/valuation systems alone wouldn’t explain aesthetic experience. Understanding aesthetic experiences requires an understanding of the link between
sensory experiences of non-primary reinforcers, or even novel, non-reinforced, abstract stimuli, with the responses we have to them. These responses include pleasure and expressed preferences, but also richer emotional reactions and such complex states as beauty, awe, the sublime, and wonder.

In attempting to understand this integrative phenomenon, it is critical that the relevant neural components be identified. It is also critical that an understanding of the neural substrates move beyond the identification and study of isolated cortical or subcortical regions. A more relevant question than “what areas are involved” is whether aesthetic experience is a whole-brain phenomenon, or is something that involves specific subsystems in a characteristic interplay.

**Information Foraging and Visual Preference**

A guiding hypothesis for the work presented here is that aesthetic appreciation is linked to “information foraging.” Unlike most members of the animal kingdom, a human spends a vast amount of time and energy learning facts about its surroundings that have little or no immediate relevance, and may, in fact, never be “useful” in an evolutionary sense. This likely reflects an adaptation to evolutionary pressures that is relatively unique to our species – we construct elaborate cognitive models aimed at “understanding” the world around us, and remember vast amounts of information that has the potential to be useful at an undetermined future time. The success of this approach critically relies on what could be considered a form of unsupervised learning – how does one know what information is potentially important (and what information can be ignored) in the absence of a reinforcement signal?

I suggest that the pleasure derived from sensory experiences with complex, novel stimuli (e.g. natural scenes, unfamiliar objects, artwork, music, literature, mathematical formulae), even when they are not directly tied to the immediate receipt of primary rewards, acts as a teaching signal to motivate information foraging – the seeking for and comprehension of knowledge (Biederman & Vessel, 2006). Two key aspects of this hypothesis deserve further elaboration. First, this hypothesis predicts that some objects or experiences will lead to more pleasure by virtue of their informational content, given the previous knowledge of the perceiver. For example, a novel juxtaposition of two objects, both of which are familiar to an observer and have various meanings or functions associated with the individual objects, would produce a pleasure signal. However, a second observer who is not familiar with each of the two component objects may not derive the same pleasure from their novel juxtaposition, as she does not have the prerequisite knowledge to parse and comprehend the potential informational content of the experience. Second, under most circumstances and all else being equivalent (e.g. informational content), novel stimuli will be preferred to familiar stimuli.

Aesthetic experiences may encompass a subset of the instances of this information foraging system in action – seeing two well known objects in a novel sculptural arrangement, comprehending the layout and vastness of a natural landscape, or finding patterns and meaning in a painting or dance performance are all encounters with “aesthetic” stimuli that have the capacity to produce pleasure and teach a person about his external environment. Human cultures have developed a multitude of disciplines that play with this system - a particular artistic domain relies on a symbolic language to deliver impactful experiences that have meaning within that system of interpretation, and are pleasureable to behold.

Evidence for the existence of an “infovore” system has come from several lines of research. First, it is known that highly complex patterns of sensory experience with no immediate survival value such as music, paintings, abstract visual patterns, etc. can activate classical “reward” circuitry (e.g. the ventral striatum; Jacobsen et al., 2006; Lacey et al., 2011; Salimpoor, Benovoy, Larcher, Daghet, & Zatorre, 2011; Vessel, Starr, & Rubin, 2012), as can novel faces and scenes, which, although more directly linked to survival value, are also highly complex stimuli that can lead to pleasure in the absence of specific reinforcement histories (Kim, Adolphs, O’Doherty, & Shimojo, 2007; Yue, Vessel, & Biederman, 2007).

It is important to mention that while it is known that the primate amygdala is able to track associations of specific stimulus patterns with their recent reinforcement history (Paton, Belova, Morrison, & Salzman, 2006) and that regions of the human orbitofrontal cortex have been shown to play a role in calculating the expected value of conjunctions of known items (Klein-Flugge, Barron, Brodersen, Dolan, & Behrens, 2013), the system outlined above for receiving immediate hedonic pleasure from complex novel experiences would represent a separate neural substrate for “unsupervised” reward signals from the comprehension of novel stimuli or concepts that are not associated with primary reinforcers. It is possible, however, that many of the same regions may play a role.

A second line of evidence supporting the hypothesis that pleasure experienced during sensory experiences acts to guide future learning comes from studies that demonstrate the central role that meaning plays in preferences. This research will be explored more fully below.

Finally, examinations of neural activations in response to viewing pleasing visual stimuli have shown that anterior regions of the ventral visual pathway, such as the parahippocampal cortex, fusiform gyrus, and inferior temporal sulcus, are sensitive to factors that correlate with preferences (Biederman & Vessel, 2006; Lim, O’Doherty, & Rangel, 2013; Vartanian & Goel, 2004; Vessel et al., 2012; Yue et al., 2007). These areas project to regions that are causally involved in the sensation of pleasure (e.g. ventral striatum) and in the conscious perception of pleasure (e.g. orbitofrontal cortex; Berridge & Kringelbach, 2013; Berridge, Robinson, & Aldridge, 2009; O’Doherty, Kringelbach, Rolls, Hornak, & Andrews, 2001; Rolls, 1999). Repeated presentation of the same stimulus, which leads to
decreased pleasure, results in reduced activation in these regions.

The Central Role of Meaning

A central debate in experimental aesthetics is the relative role of objective, low-level features for preference formation versus internal, subjective factors, such as the semantic meanings attributed to an experience. A number of studies have claimed to show that preferences for real-world scenes and objects are influenced by a number of low- and mid-level features, such as the presence of symmetry (Rentschler, Jütter, Unzicker, & Landis, 1999), aspect ratio (McManus, 1980), contrast and sharpness (Reber, Schwarz, & Winkelmann, 2004; Tinio, Leder, & Strasser, 2011), specific colors (McManus, Jones, & Cottrell, 1981), straight vs curved lines (Bar & Neta, 2006) and fractal geometry/self-similarity (Aks & Sprott, 1996; Graham & Field, 2007). Note that while all of these features may be considered “objective” properties of an object, some of them are not “local” properties, and require significant mid- and even high-level processing.

On the other hand, other authors have emphasized the importance of internal, subjective factors that are not tied to any objective stimulus features that can be extracted in the absence of knowledge about the perceiver’s previous experiences. Examples of such subjective factors include novelty (Berlyne, 1970), associative meaning (Martindale, 1984), “processing fluency” (Reber et al., 2004) and emotional responses (S. E. Palmer, Schloss, Xu, & Prado-Leon, 2013; Silvia, 2005).

However, a major issue for much of the work in this literature is the fact that in many circumstances, differences in the objective features of a stimulus set are correlated with differences in subjective interpretations. This fact is masked by a reliance on average preferences across a set of observers, with no attention paid to the degree to which different observers express similar preferences across the stimulus set. For example, there is a consistent preference for natural over urban scenes (Kaplan, 1992; Ulrich, 1981). However, this fact does not explain the source of this preference – it is equally plausible that there are objective features of images of natural environments that are more aesthetically pleasing, or that the meaning one attaches to natural environments are more aesthetically pleasing to behold.

By measuring the degree to which different people share similar preferences, Vessel & Rubin (2010) were able to disentangle the relative role of low-level, objective features of images versus higher-level subjective determinants (such as semantic associations) in determining aesthetic preferences. Using a paradigm in which preferences were estimated from a large number of forced-choice preference trials, they found that although observers did not all show identical preferences, there was a significant component of shared preference amongst the observers. However, when the same observers were asked to make preference choices about a set of abstract images that contained variation in objective, low-level features such as color, shape, contrast, and the presence of surfaces, the degree of shared preference was dramatically reduced. If observers’ preferences for these visual images were primarily determined by low-level “objective” features, the degree of agreement should have been similarly high across the two categories. The higher agreement for the real-world scenes was therefore a product of the meanings that people associated with the scenes – when the interpretation of an image is similar across a group of people, then it is likely that preferences for that image will also be similar across people (Vessel & Rubin, 2010). A similar conclusion was reached in a study on color preferences across a variety of cultures. Palmer & Schoss (2010) found that although there is a strong degree of coherence across people in their preferences for a range of colors, individual color preferences are best predicted by the valence attributed to objects that people associate with each color. Several studies using visual artwork as stimuli corroborate the importance of meaning on aesthetic appreciation (Millis, 2001; Russell, 2003).

It is important to note that these findings do not suggest that low-level objective features are irrelevant for determining the nature and quality of an aesthetic experience. However, the effect of objective stimulus features on an aesthetic experience is largely mediated by internal, subjective factors, and, when present, differences in higher-level meaning will have a larger effect on aesthetic appreciation than low-level features. This provides a clear explanation of cases of apparent counterexamples. For example, if two sets of images have a similar mixture of content, then degrading image quality for one set of images can lead to a discernibly lower average preference for those images (e.g. Tinio & Leder, 2009). Additionally, low-level features are often correlated with higher-level features. For example, preferences for the colors green and red are confounded with the meanings associated with these colors, and in natural scenes, the “lushness” of an environment is correlated with higher contrast and color saturation. Finally, it is important to note that low-level feature extraction provides the physiological basis by which higher-level features are then computed; yet while the Gestalt of a higher-level feature relies on lower-level features, under most circumstances it is not reducible or attributable to objective feature sets.

Systems for Visual Pleasure and Aesthetic Appreciation

For centuries, philosophers and scientists have recognized that an aesthetic experience of beauty, for example, is related to the more “simple” pleasures of being gently caressed by a loved one, or to an expressed preference for aspects of design such as a curved versus a straight line (e.g. Burke, 1757; Hogarth, 1753; Kant, 1790). Within the more narrow domain of visual artwork, this distinction could be expressed as the difference between mere “liking” of a painting versus being strongly “moved” during an intense aesthetic experience with a painting. The relationship between the pleasure received
from a variety of sensory experiences and the aesthetic appreciation of a much more restricted set of intensely moving experiences is unclear. One possibility is that intensely moving aesthetic experiences, such as an experience of beauty, are not qualitatively different from other instances of receiving pleasure from sensory experiences, but just represent the highest level of a continuum. A second possibility is that aesthetic appreciation involves the engagement of additional neural systems beyond those that are engaged from other pleasure-inducing sensory experiences.

Using fMRI, we measured patterns of brain activation as observers viewed images of visual artwork, and found evidence for separable neural systems underlying a stimulus-triggered “liking” reaction versus more rare instances of aesthetic appreciation (Vessel et al., 2012). Observers were shown images of artwork and indicated the degree to which they were “moved” by the artwork on a 4 point scale, with “4” indicating that the experience was highly aesthetically pleasing and they were strongly moved, and “1” indicating that the experience was not aesthetically pleasing and they were not moved at all. Importantly, observers’ behavioral responses revealed that different individuals found different artworks to be the most moving – the average correlation between the ratings of pairs of observers was 0.13 (SD 0.17). Therefore, any differences found at the group level between highly moving and non-preferred experiences could not be due to the properties of specific artworks, but instead must reflect differences in subjective responses to the artworks.

In posterior regions of the cortex, activation in the latter stages of the “ventral visual pathway” is linked to liking - increased activation of regions involved in higher-level object and scene processing (e.g. inferotemporal sulcus and parahippocampal cortex, but not early visual areas) is linearly correlated with increased liking for paintings (Vessel, Starr & Rubin, 2012). These results are consistent with previous reports of activation that is correlated with increased preference in higher-level regions of the ventral visual pathway for real-world scenes (Yue et al., 2007), faces (Kim et al., 2007), and artworks (Vartanian & Goel, 2004). It is important to note that although these regions correlate with rated liking, it is unclear whether this reflects the extraction of higher-order features that correlate with liking, or underlies computation of pleasure itself. Given what is known about the neurobiology of pleasure from studies in animals, it is likely that these regions play a role in the extraction of “important” visual features that are informationally rich, and that the feelings of pleasure are mediated via connections between these regions and positive valence systems (e.g. ventral striatum, ventral pallidum).

There is evidence for a second system in the frontal cortex that is only engaged by highly moving stimuli. In contrast to posterior regions that are sensitive to aesthetic appeal, several regions of the frontal cortex were only differentially engaged by the small subset of experiences with artwork that observer’s labeled as “intensely moving” (e.g. the “4” responses; Vessel et al., 2012). These regions included the lateral orbitofrontal cortex, inferior frontal gyrus pars triangularis, and superior frontal gyrus, which were only activated above a resting baseline for the most intensely moving images, but showed no difference between images that were merely liked or images that were not liked at all. A subsequent analysis revealed that several of these frontal regions, but not the posterior regions, showed sensitivity to the observer’s emotional responses to the images.

The view that emerges from this data is that a) there is a link between the extraction of sensory and semantic features from a sensory experience and the pleasure that is derived from that experience, and that b) separately, there are processes that are only engaged for the most moving experiences, and that these processes appear to be more closely linked with observers’ emotional responses. One possibility is that the more continuous processes reflect a relatively automatic, stimulus-driven “liking” response, whereas the second set of processes reflect more deliberate “aesthetic” processes that integrate over multiple systems and result in the more intense and sustained pleasure characteristic of aesthetic appreciation. However, much remains to be explored to characterize the nature of these two systems. For example, it is unclear how activation from the posterior system leads to activation in the anterior system, and it is also remains to be seen whether both systems independently converge on subcortical pleasure and valuation systems, or are hierarchically arranged.

Self-Relevance and the Default-Mode Network

A surprising finding from Vessel et al. (2012) highlights one important difference that may be central to understanding the conditions under which the response to an event crosses the threshold to become more than a quickly fading, stimulus-driven pleasure. In addition to the frontal regions that were activated above baseline only for the most moving images, there were also selective responses for only the most moving trials in central nodes of the “default-mode” network (DMN). The DMN comprises a set of regions that are normally suppressed when an individual engages with an externally-directed task or stimulus - tasks requiring an observer to look at images, respond to cues, make motor movements, etc. are all correlated with decreased BOLD signal in the DMN regions when compared to a “resting” baseline during which the observer has no explicit task (Shulman et al., 1997; Simpson, Snyder, Gusnard, & Raichle, 2001). Subsequent work has highlighted the role that the DMN plays in social cognition (e.g. self vs other and theory of mind), autobiographical memory and prospective planning (Amadio & Frith, 2006; Andrews-Hanna, Reider, Sepulcre, Poulin, & Buckner, 2010; Buckner, Andrews-Hanna, & Schacter, 2008; Mitchell, Macrae, & Banaji, 2006; Ochsner et al., 2005; Ochsner et al., 2004; Whitfield-Gabrieli et al., 2011). This has led to a convergent view of the DMN as a network of regions that are concerned with aspects of self-referential and self-relevant mentation (Andrews-Hanna et al., 2010; Kelley et al., 2002; Northoff et al., 2006; Spreng, Mar, & Kim, 2009).
The engagement of internally focused, self-relevant mentation is likely a key characteristic that distinguishes aesthetic appreciation from pleasure. The anterior medial prefrontal cortex, along with other core regions of the DMN, are suppressed when an individual looks at and responds to images, including most images of artwork. However, when an individual looks at an artwork that is subsequently rated as highly moving, there is a release from suppression in the DMN, and its activation rises to a level at or above that seen during the intertrial interval. Note that unlike DMN activity during “rest” periods when an observer’s attention and thoughts are solely inwardly focused, the increase in the DMN when viewing highly moving images is coincident with activation in regions of the ventral visual pathway. This coactivation of the DMN and sensory regions, which appears to be extremely rare, likely reflects the importance of self-relevance for aesthetically moving experiences, and may indeed be a hallmark of aesthetic experience (Vessel, Starr, & Rubin, 2013).

**Conclusions**

Although there are many unanswered questions about how these networks interact, these findings represent an example of how the neuroscientific study of aesthetic experience is moving beyond the exploration of single brain regions and toward a characterization as a product of interacting systems. The outlines of these network interactions are consistent with a characterization of aesthetic experience as one that involves interaction and integration across multiple neural systems, and is related to knowledge acquisition.

This work is also an example of how understanding the neural basis of aesthetic experience can make important contributions to an empirical understanding of what constitutes aesthetic experience and judgment. Brain imaging data can be a valuable tool for testing whether specific theoretical proposals and models of aesthetic experience are consistent with observed network interactions, and can even help generate new theoretical ideas. Despite the many shortcomings of current imaging methods, empirical aesthetics and cognitive neuroscience have much to gain from each other in the coming years.

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SYMPOSIUM ON CURRENT ISSUES AND DEBATES

Forty Years After Berlyne: How Far Have We Come And Where Are We Going?
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Prospects for a Literally Universal Science of Aesthetics and Creativity
Aaron Kozbelt
Forty Years After Berlyne: How Far Have We Come And Where Are We Going?

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Abstract
Forty years have passed since Berlyne's Studies in the New Experimental Aesthetics: Steps Toward an Objective Psychology of Aesthetic Appreciation (1974), a landmark work in the field of Empirical Aesthetics. How far has the field come since then? It has undoubtedly grown and consolidated, and the clearest evidence of our field's health is the success of our two specialized journals: Empirical Studies of the Arts and Psychology of Aesthetics, Creativity, and the Arts. It is also true, however, that our field is still small in comparison to others, such as empathy or decision-making. Furthermore, our field draws heavily from other fields of psychology. For instance, our models reference theories, concepts, and empirical findings from the psychology of memory, or the psychology of emotion, among many other areas. Our methods and paradigms are also sometimes borrowed from other domains. What, then, is it that provides Empirical Aesthetics with its identity? Is it just transversal to other domains of knowledge (psychology, neuroscience, aesthetics), or can it be regarded as an entity in itself? What is its relevance today within, and what is it contributing to, the larger domain of psychology of aesthetics and the arts?

We posed such questions to 10 researchers who, for different reasons, have made significant contributions to the development of Empirical Aesthetics. The aim of this Symposium is to present and discuss their responses, which underscore mainly the chief accomplishments of Empirical Aesthetics in the last decades and its pressing internal and external challenges for the future. Among Empirical Aesthetics' accomplishments, our interviewees mentioned the use of novel and ingenious experimental designs and techniques, such as eye tracking, the development of comprehensive models, the strengthening of the biological focus, and institutional development, including journals, conferences and organizations. Among the issues noted most often in relation to internal challenges for the future were: sharpening theoretical concepts, validating findings, developing new methods, coming up with a common agenda, or even a shared paradigm, and creating opportunities for training students. As for the external challenges, the interviewees noted: searching for connections with other domains of psychology, investigating in applied or non-traditional domains, contributing to understanding popular culture, and building productive interdisciplinary relations.

In addition to sharing such findings, we would like to stimulate dialogue about where we are and what we have achieved as a field forty years “after Berlyne.” This is an opportune time for such a dialogue; the IAEA Congress is the ideal venue.
Paintings and Emotion: A Nonemotivist Reevaluation

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Abstract

Arguments are presented that paintings are unable to induce basic psychobiological emotions because they do not powerfully engage with spectators’ intimate associative-memory systems. However, it is suggested that art installations containing properties subsumable under the classical concept of the sublime (physical grandeur, rarity, novelty, an association with beauty and with biologically significant outcomes), are capable of producing a memorable, though non-basic, emotional response, aesthetic awe – the peak aesthetic response as defined in Aesthetic Trinity Theory (Konečni, 2005, 2011). A skeptical view is presented of emotivism, defined as a proclivity for excessive insertion of “emotion” into scientific and lay accounts of behavior, especially regarding the arts: The loci in the domain of paintings are specified in which emotion has often been unjustifiably implicated. Psychobiological and contrasting viewpoints on emotion are outlined. Several possible routes from paintings’ attributes to viewers’ emotions are found to be analytically indefensible and psychologically improbable. Implications for empirical aesthetics are examined.

Keywords: Paintings; emotion; emotivism; emotion in painting; Aesthetic Trinity Theory; aesthetic awe; installations.

The goal of the article is to reexamine the status of emotion in the domain of paintings. One of two major claims is that paintings are unable to induce genuine emotions in viewers because their intimate associations and memories are not sufficiently engaged. Paintings may be revered, and found pleasing or interesting, but their constellation of attributes falls short with regard to the induction of genuine emotions. When contemplating any apparent evidence against this claim, one must be aware that viewers’ reports of private experiences are often contaminated by stereotypical language habits, which are formed in part by the prevalent scholarly bias about the desirability of emotion and emotionality. The suggestion is made that once aestheticians reject emotivism (Konečni, 2012a, 2012b) and adopt a rigorous psychobiological definition of emotion, the discourse about the effect of paintings would become more disciplined.1

The possible routes from paintings’ attributes to viewers’ genuine emotions will be examined in some detail and found to be analytically indefensible and psychologically improbable. Also, on the basis of Aesthetic Trinity Theory (Konečni, 2005; 2011), the second major claim will be considered – that artistic installations containing specifiable combinations of properties with psychological significance are capable of inducing a powerful and memorable response, aesthetic awe. This state has been shown to be similar to the fundamental emotions in certain respects (including the physiological component) but different in others.

Emotivism

Botum (2000) wrote convincingly about the pervasiveness of “sensitivity” and “emotion” in contemporary discourse at the expense of logic and rationality. Indeed, phenomenologically, there seems to exist an excess of “feeling” in every crevice of life and the arts have been an obvious entry point for this trend. Emotivism is a culturological fad that is often related to insincere and mawkish social discourse.

Somewhat paradoxically, emotivism seems to be a cognitive stance taken by many aestheticians, one that reflects an opportunistic acceptance of a quasi-ideological context characterized by many as anti-intellectual. “Emotion” has been so persistently attached to an entire art form, music, that a thousand-page handbook has been compiled (Juslin & Sloboda, 2010). Critical accounts regarding various aspects of the link between music and emotion have been proposed (e.g., Konečni, 2008a, 2008b). The present article complements an earlier one (Konečni, 2013a) in extending the critique to the domain of paintings.

The emotivist stance includes an often cavalier treatment of method and data: (a) participants’ experimenter-guided reports are accepted as evidence of emotion (Konečni, 2008b); (b) minor fluctuations in psychophysiological indices are interpreted as definitive indications of emotion (Konečni, 2012c); (c) an absence of effort to distinguish between emotion and mood (Konečni, 2010); (d) an absence of effort to determine whether participants are rating the emotion expressed by (or depicted in) an aesthetic stimulus or their experience (Konečni, 2008b); and (e) “scientification” of models, by relating them, without sound reason, to basic emotions – perhaps because such emotions’ link to biology offers the research a semblance of hard science. Not surprisingly, some researchers’ integration of emotivism into their worldview is coupled both with the rejection of a rigorous psychobiological account of emotion and with the frequent alleged discovery and detection of pseudo- and quasi-emotions.

Loci of “Emotion” in Painting

Writing about emotion in the domain of painting inspires some aestheticians, art theorists, critics, and artists to arbitrary and sometimes wildly romanticizing claims. A short list of the loci of “emotion” in painting and paintings follows.

1. Basic emotions have been given the attribute of stability and permanence in various painters, implying that emotions, contrary to psychological theory, are akin to personality
dispositions. Traits are arbitrarily inferred from unreliable sources. A subclass of “emotional personality dispositions” is portrayed as inexorably driven by physical handicap, illness, insanity or alcoholism. 2. It is proposed that painters’ psychological make-up (perhaps inherited), often inferred through no more than academic striving, causes them to behave “emotionally” in response to a stressful event, thus influencing artistic output (this has several subclasses; cf. Koneční, 2012a). 3. A scholar or critic locates “emotion” within a painting and claims it to be caused by, or a reflection of, the artist’s enduring personality dispositions, or an acute response to a life-event, or a combination of the two.

Such “biographical criticism” is characterized by aestheticians’ somehow inferring painters’ traits and likely responses to stress, and then reading the presence of the same emotions (though sometimes the polar opposites) into paintings. The recent “psycho-historical” proposal (Bullot & Reber, 2013) is linked to the tradition of biographical criticism and tends to encourage emotivist speculation. A preoccupation with the historical context often leads to excessive weight being given to unconfirmed data (e.g., about the alleged stressful events or sources of inspiration).

To augment point 3.: Claims have been made for many emotions to have been depicted in paintings, whether or not these emotions were said to correspond to an artist’s own. Such paintings are labeled as “expressive of emotion” or “expressionist” and fall on a continuum from extreme referentialism to extreme abstraction in the depiction or expression of emotion.²

**Psychobiological and “Aesthetic” Emotions**

“Emotion is one of the key concepts in psychobiology. Because the fundamental emotions – anger, fear, joy, sadness, and perhaps only a few others – guide and energize behavior in crucial situations, those with enormous consequences, they have been subjected to evolutionary pressures. Emotions are costly – psychologically, physiologically, metabolically – and reserved for emergencies: they are major events in human phenomenology. The main attributes of the fundamental emotions are that numerous bodily systems are involved, simultaneously and in tandem; that they are acute, occurring in “episodes,” with feedback loops; highly pronounced; readily identifiable and reportable by the experiencer; that they flood consciousness and are pan-cultural in terms of experience and expression; and that they have an unambiguous cause or object. They can be distinguished from moods, drives, traits, and attitudes” (Koneční, 2003, p. 332).

The preceding description can be offered as a relatively broadly held psychobiological view of emotion (cf. Scherer & Zentner, 2001). There are obviously other theoretical positions, but virtually none dispute that emotions involve a major physiological upheaval; and when the upheaval is due to a neutral activity (e.g., climbing stairs), it is seen as irrelevant for emotion.³ An interpretation of the eliciting event is an important component of a large proportion of emotion theories.

The mentioned basic emotions cannot be rationally denied on either phenomenological or empirical grounds even by scholars who subscribe to abstruse or arcane positions; and since these are the emotions known to all humans in terms of both subjective state and recognition in others, it will not do to treat them as merely “utilitarian” or “garden-variety.” Some aestheticians’ dismissive tone usually demands a loftier status for “refined” (e.g., Frijda & Sundararajan, 2007) or “aesthetic” emotions – alleged states that typically do not contain any or most of the components specified by the psychobiological position. When reading accounts in which key attributes of aesthetic emotions are claimed to be “detachment” and “absence of urgency” (Zentner, Grandjean, Scherer, 2008, p. 515), one wonders why a more appropriate terminology has not been sought instead of muddying the conceptual waters.

Leder, Belke, Öberst, and Augustin (2004) contend that aesthetic experience has two outcomes, aesthetic judgment and aesthetic emotion. To realize the weakness of their argument that emotion is the habitual result of viewers’ exposure to art, one must inspect the “model of aesthetic experience” (2004, p. 492). The terms in the diagram are members of heterogeneous categories, including perceptual processes, artwork descriptors, prior experience, and cognitive processes. Only one box contains an emotion-relevant term, “affective state,” and it is claimed for the art viewer by declaring ad hoc that there is continuous affective evaluation throughout all the processes (p. 493). It is not specified whether the object of affective evaluation is the artwork or the self, and whether this occurs only in the laboratory or also naturalistically. Nevertheless, from the affective-state box out pops aesthetic emotion – an emotivist sleight of hand.

Some authors (Bullot & Reber, 2013; Fig. 2, Section 3.1.2., p. 128) claim that paintings can “automatically elicit” anger, fear, and sadness. Also baffling is their claim that these pronounced states, with a strong physiological component, are allegedly induced by “epistemic processes.”

A comment is necessary about disgust as an alleged aesthetic emotion, albeit “negative” (Bullot & Reber 2013; Silvia, 2013). First, many psychobiologists would deny disgust the status of an emotion because of its reflex olfactory-gustatory nature and the notable absence of a cognitive component. In the case of certain “disgusting” artworks, such as Damien Hirst’s pickled sharks, there is undoubtedly an associationist (classical conditioning) mechanism at work.⁴ Second, any response to these works is

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² Depiction of emotion in a painting and a painting being expressive of emotion can be conceptually distinguished, but this is usually of little practical interest.

³ Of course, situations may arise when people add the arousal due to a neutral activity to an already existing elevation that had been caused, for example, by a provocation.

⁴ Incidentally, in studies conducted in my laboratory, almost no participant reported either disgust or other emotions or “emotions” to Rembrandt’s Anatomy Lesson – only admiration.
presumably “aesthetic” only because Hirst presented them as “art” (in the Duchamp tradition). One wonders if a century after Duchamp, the artist’s intention—a hackneyed imitative intention—should suffice to make something “art” (instead of “bluff art,” see Koneční, 2005). And if not art, then the shark is only an object that induces nonaesthetic disgust.

Diverse Empirical Attempts

Psycho-aesthetics has since its beginnings ascribed an emotional substrate to viewers’ reactions to visual stimuli. In her report of one of the first systematic experiments in the English-speaking world, Lilien Martin (1906) addressed a question posed in Fechner’s aesthetic theory: Which features does a visual stimulus, one that has empirically passed the “aesthetic threshold” (aesthetische Schwelle), must have to pass the emotion threshold also? Martin’s experiments involved twenty participants and forty stimuli (lines; circles; an ellipse). Only the circles passed the aesthetic threshold and no stimuli passed the emotion threshold—despite the usually very careful Martin’s overinterpretation of weak like-dislike data.

In a scaling study of paintings (Sargent-Pollock & Koneční, 1977)–informative, in the negative sense, about emotivist claims—participants individually evaluated each of 120 paintings on scales of pleasingness, interestingness, and the desire to own a reproduction. A skin-conductance (SC) measure (response to image over baseline) was obtained for each participant viewing each painting. Sixty works (“Renaissance”) were painted between 1440 and 1570 and the other sixty in the period 1909-1965. Each painting was viewed for ten seconds, followed by a ten-second rating period in the presence of the image. Paintings were seen in six groups of twenty, with interpolated rest periods, during each of which the SC baseline was obtained.

The evaluation data were meaningful, extending Berlyne’s (1971). Of the greatest interest for present purposes was the fact that SC responses were uncorrelated with verbal ratings. Moreover, a clear pattern was observed on both the between- and within-subject basis: In a group of twenty, exposure/baseline ratios initially approached 1.20, then rapidly declined to 1.00-1.05, stabilizing at close to 1.00 for the remainder of the session. Furthermore, in the later groups of twenty, even the initial ratios were as low as 1.08-1.12. This pattern obtained for both the Renaissance and 20th-century works even though there were large differences between the two groups on all ratings. In short, beyond the mundane initial effect of task novelty, there was no physiological effect of the paintings. In fact, the physiological data pattern was replicated in pilot studies in which images of standard kitchen furniture were used rather than famous paintings.

Perhaps surprisingly, there is a dearth of subsequent studies of this type. One possible reason may be researchers’ unwarranted assumption that findings contrary to those obtained by Sargent-Pollock and Koneční somehow must abound—which is emotivist fiction. Another possibility is that these findings have been widely replicated but not reported, because the absence of paintings’ physiological effects was neither interesting nor pleasing to researchers.

Tröndle and Tschacher (2012) recently claimed to have obtained physiological evidence for the emotional impact of viewing artworks. The authors equipped hundreds of visitors to a museum in Switzerland with an electronic glove with measurement sensors and a transmitter that sent physical-position and physiological data to wireless receivers. There were two physiological measures, SC and heart rate. Participants’ path and length of stay in front of any of the artworks were unrestricted.

A detailed methodological critique of this work is available in Koneční (2013a), so that only a few remarks are in order. Evaluations of the “emotional” aspects of paintings were given by participants during exit interviews, long after viewing. In the principal-component analysis of assessments, the only factor (of five) that was related to emotion, “Negative Emotion,” had to do with what the paintings conveyed, not the participants’ own state. Only five works were discussed in any detail. One of these, described by participants as containing “aggressive emotions,” had the word “aggressive” prominently in its title; no physiological evidence was provided. As for the most prominent works on display (two Warhols), the average viewing times were only nine seconds for Flowers (1966) and 10.5 seconds for Campbell’s Condensed Tomato Soup (1962).

Tröndle and Tschacher (2012) are mostly careful to avoid using the term “emotion,” yet they interpret the transient increase in arousal when visitors enter the exhibition as being due to an “encounter with art,” ignoring the mundane effects of spatial movement. Despite the authors’ (moderate) claims to the contrary, there is no valid support for the position that paintings produced emotions in viewers. Yet the call of emotivism induced the New York Times critic to entitle her piece on this work “Heart-Pounding Art” (Spears, 2012).

From Works’ Attributes To Viewers’ Emotions

This section reports the mostly futile search for the analytically defensible and psychologically possible routes by which paintings—qua artworks, by virtue solely of their artistic attributes—may induce genuine psychobiological emotions in viewers.

Nonfigurative Paintings

Abstract works from Kandinsky’s Abstract Watercolor (1910) to paintings by de Kooning, Rothko, Pollock, and, for instance, Rauschenberg’s Erased de Kooning Drawing (1953) are characterized by a complete absence of any kind of narrative. They are constructed so as to eliminate any easy associations to the world outside the painted image (or blank but framed “image”). One surmises that even fervent emotivists do not claim that basic emotions are induced by these works qua art.

Note that absolute music, even without narrative content and ready associations (by onomatopoeia or evocative titles), has a broad range of arousal-raising devices. Yet even in the case of pure instrumental music, formalists have justifiably questioned the idea of genuine emotions being induced (cf.
Kivy, 1990; Koneční, 2013b). What does abstract art have? Painterliness, color, symmetry, balance, novelty, complexity (and their relative absence) may contribute to judgments and experience, and even occasionally raise arousal, but are most unlikely to elicit emotions. When intense reds in a de Kooning are brought up, one must not mistake folk ideas about redness for science. There is little proof for an emotional effect of color. If there is some, it is likely to be on mood or attitude and it would be dependent on long exposure to massive swaths of color in institutions.

**Figurative Paintings** With regard to possible emotion induction, two correlated aspects of figurative paintings must be addressed: (a) the pictorial representation of objects that exist in the real world and (b) story-telling by painterly means (visual non-verbal narrative). Objects may be represented with various degrees of accuracy (degrees of “likeness”). Stories may be told in varying detail, leaving more or less for spectators to fill in; their knowledge may be specialized (the Bible, heroes, battles) or a consequence of daily life in a particular place and time.

One should dismiss from consideration a particular category of paintings, an example of which is a portrait of a loved person no longer living. On perusing such a painting, one may become genuinely sad, which may have nothing to do with the painting’s artistic value or even the degree of likeness. The painting does not induce emotion *qua art* but as a generalized conditioned stimulus. An indifferent snapshot of the person might produce a similar effect, sadness.

How do figurative paintings compare with vocal and “program” music? Even the formalists do not dispute that program music and, especially, vocal music are capable of inducing genuine emotions. The operative ingredient in vocal music is considered to be the verbally narrated story and in program music the movements’ titles may be complemented by associated imagery, episodic memory, and onomatopoeia. Except for a rare textual exhortation, paintings are devoid of words and lack the temporal dimension of songs. They cannot tell stories, certainly not in detail or step by step. All that paintings can do is capture a crucial moment of a story in a static presentation. Realizing this, artists have sometimes attempted to introduce sequence by creating triptychs, but this is rare and weak. A “trick” sometimes employed by painters is to increase the amount of information by including objects with rich associations, such as musical instruments during a boom in music-making in 17th-century Holland. Of course, the most efficient device for increasing the amount of information and showing behavioral intent has undoubtedly been perspective – although even when used in a painting of large size, it is not enough. One can ascertain this by pondering the hypothetical effect on spectators’ emotions – or the almost certain absence of any – of the largest painting in the Louvre (660 x 990 cm), Veronese’s *The Wedding at Cana* (1562-63).

Wullschlager (2013) wrote that “religion as well as philosophy always suspected art’s ability to move” and she is joined by other art critics who hold opinions that run counter to emotivist platitude. One can point to numerous superb religious paintings that lend support to the anti-emotivist view. Key examples from the Venetian Renaissance master Giovanni Bellini find the skeptic on solid analytic and pictorial grounds when claiming that the judgment about the absence of an emotional effect is not simply a secular bias.

**Figurative Paintings Portraying Emotions** In all of the mentioned Bellini paintings the portrayal of emotion, expressed in faces, gestures, and the palette, is essentially nonexistent – and this is not unusual for the Renaissance. However, a philosopher friend wrote that she had to take her eight-year-old daughter out from the Louvre because the girl was scared of “the bloody Catholic martyrdom paintings.” The girl was probably associatively fearing injury as she would also want to avoid looking at a bloody street accident. She was not responding to the paintings *qua art* but to an imagined overgeneralization.

As for blood in the Renaissance, it is not frequently portrayed. In dozens of portrayals of St. Sebastian, between 1450 and 1620, despite numerous arrows – from one in El Greco (1578) to a dozen in Mantegna (1490) – there are few drops of blood. Without exception, St. Sebastian’s face shows a stereotypical pious resignation. Only a few paintings show beholders and their faces are devoid of sympathy and anguish, essentially expressionless.

Minimal emotion is portrayed in Caravaggio’s paintings of *Head of John the Baptist* and *Salome* (1606; 1610), in his *David Victorious over Goliath* (1599), and in Guido Reni’s (1605) work on the same theme. In the 1599 painting *Judith Beheading Holofernes* by Caravaggio, Holofernes’ face understandably shows horror at the moment of having his head cut off, but there are unrealistic streams of blood and, other than in her corrugator muscle, Judith’s face shows little. From an objective analytical viewpoint, one concludes that these paintings contain an insufficiently detailed narrative and provide few good reasons for viewers to identify with the characters and experience emotions empathetically. In Picasso’s *Guernica* (1937), the story is nonreligious, recent, and publicized in a favorable humanistic light. Yet the message is hard to read even with foreknowledge. The chosen formal elements are a dubious cause of any emotion.

What of Goya’s (1814) *El tres de mayo*? The faces of people about to be shot show anguish. Their fate is foretold by the corpses of people already shot. Few do not admire this painting, but do they experience emotion? Even if the context of resistance to Bonaparte is known to viewers, does the portrayal reach their individual memory networks so that empathy would take place and lead to acute sadness or anger? The answer is probably negative.

The same colleague described being “saddened” by the “kitschy” *The Execution of Lady Jane Grey* (Delaroche, 1833). She knew the story and “was responding to violence against women more than to the painting itself;” her “sadness” was much more a mood than an emotional response.” This retrospectively introspecting account is telling: The viewer framed the story (previously known to
her, not one shown pictorially) as a social issue and responded to it, not to the painting qua art.

Paintings are poor candidates for eliciting genuine emotions because they are, as a medium, incapable of convincingly telling stories about the real-world or otherworldly events in the detail necessary for viewers to generate mental links to their own experiences. Paintings’ narrative is too thin and remote, and the protagonists too dissimilar to allow identification and empathy.

Art Installations and Aesthetic Trinity Theory
The second major claim of the article, based on Aesthetic Trinity Theory (ATT; Konečnì, 2005; 2011), is that installations, with specifiable constellations of properties of psycho-aesthetic significance epitomizing the sublime, are capable, unlike paintings, of inducing a rare and powerful emotional response, aesthetic awe. The “trinity” refers to the tripartite structure that includes, in addition to aesthetic awe, the less pronounced and more frequent states of Being-Moved and (physiological) Thrills (or Chills), in a hierarchical arrangement (Konečnì, 2005; 2011).

In ATT, aesthetic awe is not considered a basic emotion itself, but rather a derived (although primordial) mixture of two basic emotions, joy and fear. Like joy, aesthetic awe requires existential safety, a fair degree of control over fear-inducing danger. Also like joy, and unlike pure fear, aesthetic awe is an emotion that can be easily “switched off.” This peak aesthetic response is viewed as a prototypical one to the sublime stimulus-in-context (with the sublime external to the observer). The sublime is defined independently of aesthetic awe: Among its attributes are physical grandeur, rarity, and novelty; a complex relationship exists with beauty.

It is proposed that at least some installations are more likely than paintings to induce aesthetic awe in spectators by virtue of their amenability to being constructed such that they contain the sublime – the abovementioned attributes of which can be analyzed on three stimulus dimensions identified by Berlyne (1971): The psychophysical, the statistical, and the “ecological” (classical conditioning). These properties capture somewhat the enormous scope of installations, from the hyper-realistic to the interactive to the theatrical. The conscious (or unconscious-intuitive) use of these properties illuminates the route by which aesthetic awe may be induced.

Large size is the most prominent psychophysical property, used since antiquity to honor gods and kings. High technology has changed the themes. Two examples of gigantism are Richard Serra's abstract steel forms (The Matter of Time, 2005) and Hirst’s Charity (2002-2003), the six-ton bronze sculpture of a girl with a charity box. Arrogance in Serra, an affected theatricality in Hirst: Large size is not sufficient to result, qua art, in aesthetic awe.

The second class of properties is statistically-based. With For the Love of God (2007; a platinum scull, encrusted with over 8,500 diamonds), Hirst outdid competitors regarding rarity: it may amaze but not move spectators. Hirst also leads in the use of the ecological property, which is defined in terms of reinforcements associated with artworks. While Koons’s thirteen-meter Puppy may excel on the positive-reinforcement side, Hirst wins on the side of the noxious, with pickled shark, butchered animals, and maggots feeding on a cow’s head. But such works are too sterile to induce anything but disgust – and disgust, as argued above, is neither a genuine emotion nor is it likely to be transformed into aesthetic awe.

However, there exist installations, such as Olafur Eliasson’s “artificial sun” (The Weather Project in Turbine Hall of the Tate Modern, London, 2003), which combine aspects of all three classes of artwork properties in a sophisticated manner so as to capture the qualities of the sublime. The sight of a complex, yet seemingly straightforward arrangement for a stunningly novel, yet vaguely familiar, enormous yellow ball to hover, suffusing the air in the gigantic space with life-giving light, invariably stunned visitors. Many lay supine on the floor, aesthetically overwhelmed. In interviews, “awe” was by far the most frequent term used by respondents for their aesthetic experience.

Implications for Empirical Psycho-Aesthetics
Even a partial acceptance by psycho-aestheticians working in visual arts of the conclusions reached here would lead them to be more cautious in claims regarding emotion. Any discussion of emotion – in the artist, the artwork, the appreciator – should be preceded by a definition which the author espouses. With regard to empirical work, while participants’ self-reports of emotion or mood (and their absence) are indispensable, and cannot justifiably be replaced by psychophysiological and fMRI data (Konečnì, 2012c, pp. 8-9), an awareness of the various biases with such reports, uncovered especially in the music-and-emotion area, should lead to increased methodological vigilance. Being cognizant of emotivism may facilitate the detection of false positives in emotion data and constrain theoretical overreaching.

Because of their novelty and multifaceted nature, installations present special problems of classification, analysis, and interpretation. But they should prove a rewarding medium for empirical psycho-aestheticians, especially those who are interested in genuine emotional responses to art. ATT provides a useful theoretical milieu, with aesthetic awe, being-moved, and thrills/chills all being reliably reportable and measurable. Artists who specialize in installations have proved to be open to experimentation and input, in part because the creation and setting up of their work are so often collaborative. And there has been a trend to design flexible and often very large exhibition spaces in museums and nontraditional locales.

As for researchers with an interest specifically in paintings, who decide to abandon the pursuit of emotions, they may

5 Scholars sometimes use Berlyne’s stimulus classes without giving proper credit. An example is “disfluency” (Bullot & Reber, 2013, pp. 135-136): this neologism refers to an unacknowledged derivation from Berlyne’s concepts.
instead wish to reinvigorate the formalist approach in psycho-aesthetics. This would be a move away from an interest in expressive and referential aspects to a renewed focus on line, shape, texture, color, balance, particular proportions (such as the golden section), and other compositional issues. At least a branch of empirical aesthetics might be devoted to research inspired by the formalism of Greenberg (1961, 1999), which links artistic value to aesthetic experience, with the latter understood as contemplation of what “strikes the eye” in an aesthetic object. One task of many would be to study the process of self-examination and reduction to the core within art forms.

The research guided by formalist ideas would ignore Conceptualism, with its aesthetics-free cultural and political agendas; and it would be immune to attempts to historicize and contextualize the appreciation and analysis of artworks (e.g., Bullot and Reber, 2013). It would abstain from divining an artist’s motivation and intention – so dominant in the questionable biographical stream of criticism. Formalist analysis is – or can be, when supported by a high level of training in methods – manifestly more reliable than the contextual and the historical. Formalism addresses the artwork as is and shuns talk and reading-in – so essential to Conceptualism and the historical approach.

One wonders if proponents of formalist analysis did not reject history, context, and artist intention – and were disinterested in expression and representation – because they were introspectively aware of not experiencing emotions while viewing paintings they most admired?

References


Prospects for a Literally Universal Science of Aesthetics and Creativity

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Abstract

Taking a personal view of contemporary research on aesthetics and creativity, I explore prospects for how contemporary themes in the scientific study of aesthetics and creativity may play out in the most universal contexts. I begin by considering aesthetics via analogy to another non-mainstream intellectual enterprise, the study of communication with extraterrestrial intelligence (exemplified by the Pioneer spacecraft plaque), and attempt to determine how comprehensible human aesthetic and creative products might be to other intelligent species (and vice-versa). This thought experiment highlights what aspects of the study of aesthetics might be considered the most legitimately scientific. Emphasizing sensory and cognitive parameters and their pragmatic evolutionary basis, I argue that at least some aspects of aesthetics and creativity are likely to be universal – particularly those arising out of basic adaptations to evolutionary pressures to process information effectively. The Berlyne/Martindale psychobiological theory highlights many of these issues. I argue that resolving details of the theory and its relation to other frameworks, using objective metrics when possible, should be a priority for studies in empirical aesthetics.

Keywords: aesthetics, creativity, evolution, perception, cognition, psychobiology.

Prologue: Sagan vs. Gombrich

When I was a child, astronomer Carl Sagan (1934-1996) was my top intellectual hero, more than anyone else influencing my decision to become a scientist. Later, additional figures closer to my research areas entered my pantheon, including art historian E. H. Gombrich (1909-2001). Imagine, then, my horror when I encountered this passage by Gombrich (reprinted in Gombrich, 1982, pp. 150-151), critiquing the plaques (Figure 1) that Sagan convinced NASA to put on the Pioneer spacecrafts in 1972 and 1973 as messages to any alien intelligence who might ultimately encounter them:

These beings would first of all have to be equipped with ‘receivers’ among their sense organs that respond to the same band of electromagnetic waves as our eyes do. Even in that unlikely case they could not possibly get the message…reading an image, like the reception of any other message, is dependent on prior knowledge of possibilities…we see which of the lines are intended as contours and which are intended as conventional modeling…As for the fact that ‘the man has his right hand raised in greeting’…, not even an earthly Chinese or Indian would be able to interpret correctly this gesture…The trajectory [of the ship at the bottom]…is endowed with a directional arrowhead; it seems to have escaped the designers that this is a conventional symbol unknown to a race that never had the equivalent of bows and arrows.

Sagan (1973a, pp. 27-28) responded to Gombrich’s critique by noting that only the visible and radio portions of the electromagnetic spectrum generally pass through planetary atmospheres, and that technically advanced beings should be able to scan the plaque at other frequencies as well. Sagan also argued that the arrow symbol may not be totally arbitrary given the usefulness of real arrows in hunting, and that in any case something of the meaning of the arrow would be communicated by the presence of the Pioneer craft itself.

Both points of view are defensible, raising a number of valuable issues for consideration; one’s preference is probably just a matter of taste. This tension reflects a broader disparity between the sciences and humanities, or between those who would give priority to the universal versus the particular. Postmodernism aside, even within the psychological study of human aesthetics and creativity, a substantial number of socio-culturally-minded researchers have expressed doubts about broadly valid scientific claims about these topics: witness, for instance, Sawyer’s (2006) emphasis on the huge variety of ways in which the concept of ‘art’ is defined and practiced, or Csikszentmihalyi’s (1988) assertion that creativity cannot be meaningfully regarded as an intrinsic property of an artifact, but instead is a value judgment arising from the interaction of the domain, field, and individual creators. In the case of the Pioneer plaque and other instances of human attempts to communicate with extra-terrestrials, the dispute cannot readily be resolved, since as yet we have no instances of alien intelligence to study.

However, this lack of subject matter has not prevented visionary scientists, including multiple Nobel laureates, from
serious work on the prospects for meaningful communication with alien intelligence – including issues like optimal frequencies of radio transmission, what kind of content might be most readily communicated, reasonable means of detecting a signal from another technical civilization, appropriate methods of signal decryption, and so on (see Sagan, 1973b). Much of this discussion was informed by the famous Drake equation, which seeks to estimate the current number of technical civilizations in our galaxy by multiplying a number of relevant factors, almost none of which can currently be reliably estimated. Despite this, the impression that these highly theoretical – or less kindly, fringe – topics seemed at least somewhat scientifically tractable provided an incentive for other attempts at extraterrestrial communication. These include the Arecibo radio message transmitted to the star cluster M13 in 1974, and the famous LP containing encoded pictures and audio – including 90 minutes of music from around the world – put aboard the Voyager spacecrafts (see Sagan et al., 1978).

Interestingly, this line of speculation about the prospects of communicating with extraterrestrial civilizations has a long tradition, dating back at least to the astronomer and polymath Christiaan Huygens (1629-1695). In a posthumously published book, entitled The Celestial Worlds Discover’d: Conjectures Concerning the Inhabitants, Plants, and Productions of the Worlds in the Planets, Huygens (English translation, 1798) speculated about the environments of other planets, as well as the kind of life, intelligence, and culture that might arise on suitable worlds. While he acknowledged that there may be great variety in extra-terrestrial organisms, he also argued that many aspects of their lives would be comprehensible – for instance, in the nature of many of their sensory capabilities, and in their having geometry, writing, and music. On the latter point, Huygens provocatively speculated that alien intelligences would exploit the mathematical basis of the relations between musical tones, would probably have a more sophisticated understanding of music theory than humans, and thought it very likely that the perfect fifth and major third would be commonly used intervals.

Tellingly, Huygens grounded his discussion in the following way: “For why, supposing other Nations and Creatures endued (sic) with Reason and Sense as well as we, should not reap the Pleasures arising from these Senses as well as we too?” (pp. 86-87) This passage presciently centers a conceptualization of aesthetics in the same terms as those of Baumgarten (1750/1970), who established the modern usage of the term aesthetics as sensory cognition – that is, the ability to judge based on the senses instead of the intellect.

This way of framing the discipline of aesthetics has extraordinary scope. Martindale (2007, p. 181) teased out its implications thus:

Baumgarten was closer to the truth than many later aesthetic theorists. Baumgarten’s main error was to

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6 The audio contents of the Voyager record may be heard at http://goldenrecord.org/#discus-aureus.

7 Non-human instances include the songs of humpback whales and many species of birds (see also below).
on their morphologies, the nature of their sensory modalities, and their basic capacities to process information.\(^8\)

Despite the rich variety of organisms produced by evolution, strong claims have been made about universal aspects of the evolutionary backdrop and dynamic. For instance, Campbell’s (1960) blind variation and selective retention – or BVSR – model of creativity (later greatly elaborated by Simonton, 1999, 2011) posited that any ultimately creative or inductive idea necessarily arises from BVSR. A related notion is Dawkins’s (1983) ‘universal Darwinism,’ which argues that any life in the universe will have evolved through the process of Darwinian natural selection, and which seeks to explain evolution across a range of natural and social science domains. Indeed, frameworks like information theory, game theory, complexity theory, self-organization, and economic principles like bounded rationality seem very generally applicable, so as to have a legitimate claim on universal relevance among intelligent organisms – at least in considering the behavior of self-interested agents that arose from an evolutionary process and which operate in an environment characterized by some degree of uncertainty and limits to their information processing capacity. The universal pragmatic needs of organisms (e.g., perceiving and navigating their environment, obtaining nourishment, mating successfully) provide a strong perceptual and information-processing basis on which to seek universals relevant to aesthetics.

**Sensory Modalities**

Even among terrestrial animals, sensory modalities vary greatly: consider a bat’s experience of echolocation, a frog’s perceptual sensitivity to flying insects, or a fly’s direct experience of surface tension. Nonetheless, these adaptations have similar purposes: taking advantage of ambient energy or chemical signals to convey to the organism sometimes quite distal information relevant to its survival. For instance, the fact that eyes have independently evolved among Earth organisms some forty times (see Goodwin, 1994) underscores the inherent utility of organisms processing information from the environment in terms of electromagnetic radiation.

Some basic computational challenges of vision include fundamentally monochromatic problems like image segmentation, understanding 3D form, and identifying objects. Many lower-level aspects of vision in humans and other animals – e.g., Gestalt principles of perceptual organization, lateral inhibition processes, an emphasis on edge detection – appear to have a robust and demonstrable computational basis that makes them inherently adaptive at teasing out meaningful structure and regularities in the visible world. One might not be surprised to find similar processes operating in the nervous systems (or their equivalents) of extra-terrestrial organisms.

**Example: Line Drawings**

To underscore the relevance of basic visual information processing to potentially universal aesthetics, consider the example of the use of lines in images. Human viewers readily understand line drawings as depictions of 3D objects, even though line drawings differ in many important respects from real objects - largely because oriented lines correspond to our representations of visual information in early stages of processing, in area V1. Processing lines is very adaptive, since typically they correspond to edges or other areas of interest – both in survival terms but also potentially aesthetics terms. Moreover, lines can serve many different functions, such as changes of planes, edges and contours, shading, etc., which help to define the 3D structure of an object on a 2D surface.

Form information is particularly potent when lines are joined together. For instance, when two lines are joined in a ‘T’ configuration, the human visual system appears to automatically interpret the vertical line as disappearing behind the horizontal line. Thus, with just two properly configured lines, a sense of relative depth can be conveyed. And as with Gestalt principles like good continuation, computationally this is much the most likely arrangement of forms in the real world that would give rise to this kind of junction\(^9\) – rather than, for instance, T-junctions being just a mere local cultural convention. It is no wonder that artists spontaneously deploy T-junctions in their depictions more than do non-artists (Ostrofsky, Kozbelt, & Seidel, 2012), and that T-junctions have been commonly used in human artistic depictions for at least the last 17,000 years (Biederman & Kim, 2008).

Returning to the Pioneer plaque – while the aesthetic quality of the line drawings may be up for debate, it is not unreasonable to think that the recipients could infer at least some information about the 3D form of the depicted objects, even without having ever seen such objects before. The extent to which this carries aesthetic-specific information, as opposed to mere form information, is probably a separate issue – but the key point is that our perception is biased to interpret stimuli like T-junctions in particular ways, which are computationally grounded through the activity of evolution, are decidedly not arbitrary, and are rife with aesthetic potential.\(^10\)

**Translation**

\(^8\) Naturally, evolutionary processes acting on highly varied environments over expansive timescales produce enormous variability, even among organisms on Earth. Moreover, some (e.g., Gould & Lewontin, 1979) have argued against optimal adaptationism, also citing the importance of seemingly arbitrary historical contingencies that act to entrench subsequent phylogenetic developments in morphology (e.g., Gould, 1989).

\(^9\) Relatedly, see Ramachandran & Hirstein’s (1999) notion of ‘abhorrence of coincidence’ as a basic aesthetic principle.

\(^10\) In passing, I note a similar tension in the oft-argued issue of the extent to which Renaissance perspective, as devised by Brunelleschi and articulated by Alberti (1435-6/1966) was ‘discovered’ versus ‘invented’ – that is, the extent to which Renaissance perspective represents the way the world actually looks.
If the processing of form information is relatively straightforward, other aspects of sensory processing raise greater complications. One of the most notoriously subjective aspects of our mental life involves the subjective experience of color – e.g., how do I know my red is the same as your red? Across species and modalities, this issue is exacerbated by differences in the parameters of organisms’ sensory systems – for instance, bees’ ability to see in ultraviolet, or humpback whales’ ability to hear very low frequencies.

If one takes seriously the possibility that the aesthetic artefacts of one species could in principle be appreciated by another species, then even within a comparable modality, the potential incompatibility of the specific parameters of each species’ sensory systems could represent a significant impasse. In that case, some form of sensory translation across species would be necessary – a potential deal-breaker for my argument about aesthetics, of the ‘poetry is what gets lost in translation’ variety.

Example: Birdsong Transcription

However, one may point to at least one real-life example of the productive use of aesthetic material across species: acclaimed French composer Olivier Messiaen (1908-1992), who engaged in perhaps the most sustained, deliberate, and thoroughgoing inter-species translation of aesthetic material in human history. Messiaen could identify hundreds of different birds by ear, would frequently notate their songs in the wild, and made birdsong an integral part of his musical language in most of his works, especially in the second half of his long compositional career. Messiaen’s eminence is hard to deny – he is rated among the most prominent 20th century composers (Murray, 2003), with hundreds of recordings of his music available.

Here is Messiaen’s description of his process of transcription (quoted in Johnson, 1975, p. 117):

The bird…sings in extremely quick tempi which are absolutely impossible for our instruments; I am therefore obliged to transcribe the song at a slower tempo. In addition, this rapidity is allied to an extreme acuteness, the bird being able to sing in excessively high registers which are inaccessible to our instruments; I transcribe the song, therefore, one, two, three, or even four octaves lower…

Messiaen’s use of avian aesthetic material, and his accommodation of the material to human limitations of audition and dexterity, can serve as a model for how inter-species aesthetics might operate.11 In any case, Messiaen’s process does not appear materially different than cases of human artists working to communicate something of their own idiosyncratic perceptual experience – e.g., a recent book by Hackett (2013), in which he describes his attempts to convey the perceptual distortions of his condition of diplopia (double vision) in a series of painted grids.

Such examples indicate that some process of inter-species aesthetic exchange is possible, though they do not imply that the process of translation across species or sensory modalities would always be easy or would always work. Indeed, besides differences in basic sensory apparatuses, one must also reckon on inter-species differences in basic cognitive parameters equivalent to working memory, long-term memory, speed of information processing, subjective sense of time, embodiment issues associated with morphological differences, and other factors (cultural and environmental as well as biological) that we can only guess at. It is worth noting, however, that many of these issues apply to human-bird differences. The key point is that there is nothing in principle that would obviate all inter-species aesthetic exchanges.

Psychobiology

The preceding discussion has emphasized information processing at basic sensory or psychophysical levels. It is no accident that psychophysical properties are a prominent aspect of Berlyne’s (1971) celebrated psychobiological theory of aesthetics, later extensively developed by Martindale (1990). This powerful theoretical model is rooted in basic psychological and biological principles like hedonic selection, habituation, peak shift, and so on. It seeks to explain aesthetic preference for certain stimuli, based on the arousal potential or impact value of that stimulus. In this view, artistic creators seek critical attention for their productions, and must therefore produce work that is ever more attention-grabbing (i.e., higher in arousal potential). The arousal potential of a stimulus is determined by its psychophysical characteristics (e.g., stimulus intensity), ecological properties (signal value of meaning), and, most importantly, by its collative properties (e.g., novelty, complexity, surprise). The theory is overtly universalist, applying to any cultural tradition of aesthetic creation; indeed, Martindale (2007) showed how several dozen robust findings in empirical aesthetics can be derived from basic properties of neural networks – another hint that the notion of literally universal aesthetic principles may not be far-fetched.

How do the three means of increasing arousal potential relate to the theme of inter-species aesthetic exchanges? The psychophysical aspects of aesthetic stimuli are probably the easiest to consider in objectively measurable terms that might translate across species, which is why I have emphasized them in this paper. Indeed, there is nothing about the psychophysical aspects of stimuli that even necessitate a creator: one can have an aesthetic response to purely natural scenes and phenomena. One need only be able to perceive the stimulus in the first place.

In contrast to psychophysical aspects, assessing the meaning of a stimulus is inherently more subjective. Collative properties are more complicated. They have special status in Martindale’s (1990) theory, as they appear to have the most long-term potential to increase arousal potential as

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11 Even in cases where Messiaen pushed the very boundaries of the human auditory modality, as in the ‘Epode’ section of his orchestral wok Chronochromie, written for 18 solo string parts, each playing an independent fast-tempo birdsong.
artistic traditions develop – mainly by increases in novelty and complexity. The constant pressure for novelty arises out of habituation, which, as Martindale (1994, p. 162) noted, “is a universal property of nervous tissue.” This provocative epigram suggests that processes like habituation and peak shift would also be characteristic of the equivalents of alien nervous systems, as I argued earlier vis-à-vis psychophysical processes like edge detection and lateral inhibition.

Despite their theoretical importance, applying collative properties to universal aesthetics is problematic. Novelty is typically assessed by comparison to a set of relevant exemplars, rather than being an objective property of an artifact (Csikszentmihalyi, 1988). Complexity often seems intuitive but is notoriously slippery to define (see, e.g., Pagels, 1988). Unpredictability may be easier to quantify using information-theory approaches (see, e.g., Huron, 2006), though these must be operationalized with some care. All told, a better understanding of the nature and relations of various collative properties is an issue of paramount significance in empirical aesthetics.

Unresolved Issues

The evolutionary and psychobiological basis of the Berlyne/Martindale theory makes it probably the most attractive and amenable means of framing the issue of a truly universal science of aesthetics and creativity. In this section, I note some ways in which this perspective could be further developed.

Even within the Berlyne/Martindale theory, some issues (e.g., the relation among different collative properties) remain unresolved, even in the best research in that tradition. Consider Martindale’s (1994) computer-based text analysis of the history of British poetry, which defined arousal potential by a set of measures including semantic intensity, number of word associates of each word, percentage of words occurring only once, and use of long versus short words and phrases. In examining the transition to Neoclassical poetry around the year 1700, Martindale found that some variables, like polarity and the coefficient of variation of phrase length decreased but that this was more than offset by increases in other measures. Equally weighting each factor indicated a general increase in arousal potential, consistent with his theory. However, it is possible that equal weighting is inappropriate and that different weightings would produce different results. A greater understanding of these constructs and their relations, wedded to careful methodologies and assessment, are necessary if strong hypotheses about aesthetics are to be tested properly.

Relating the Berlyne/Martindale theory to other well-developed theories would also be informative. Indeed, there are some striking lacunae here. One involves the relation between Martindale’s computer-based text measures (e.g., of arousal potential or primordial cognition) and real-time indices of creative thought, evident in concurrent verbal protocols (which are more traditionally associated with more cognitive theories of creativity). To what extent are the implications of the Berlyne/Martindale theory borne out by micro-level analyses of creative ideation, rather than in, say, finished literary texts? (See Kozbelt et al., in press, for an initial exploration.)

Another unresolved issue involves the connection between psychobiological variables and metrics of eminence (e.g., Murray, 2003), which show robust internal consistency and very lawful distributions that are invariably positively skewed. To what extent do the works of the most eminent creators differ from those of their less eminent counterparts along various psychophysical or collative variables? To what extent do different creators adopt different strategies in the creative process (see Kozbelt, 2012) to take advantage of different means of arousal potential? More broadly, what is the role of the attention-grabbing aspect of arousal potential in the ultimate formation of aesthetic canons? Is there a distinction between attention-grabbing and attention-keeping works of art? How would the Berlyne/Martindale framework be extended to account for such a distinction?

Moving outside the strict bounds of the Berlyne/Martindale theory, but still pursuant to the question of universal aesthetics – it is striking that human aesthetic artifacts show a number of seemingly arbitrary but objectively measurable regularities, which appear to transcend cultures and epochs. Here I mention just a few. One involves statistical regularities in the spatial frequency distribution of artistic images (Graham & Redies, 2010), irrespective of the distribution inherent in their subject matter. Another is that in the domain of music, melodies from around the world systematically show a prevalence of small intervals over large ones, a frequent arch-like structure, and a tendency for large intervals to ascend and small intervals to descend (see Huron, 2006). A cross-modal phenomenon is the bouba-kiki effect (Köhler, 1929), whereby the sound “bouba” is overwhelmingly associated with curved forms, and “kiki” with angular forms, is another classic consistency that appears to be essentially universal among humans. In each case, why is that particular pattern evident, and not the reverse? If these patterns are virtually universal among human cultures, it is tempting to attribute them to biological causes, which ultimately stem from an evolutionary basis. Would such biases transcend our species?

Conclusion

Empirical aesthetics is a vibrant but non-mainstream research enterprise. I have attempted to determine the most robustly scientific aspects of empirical aesthetics through the thought experiment of considering how comprehensible human aesthetic and creative products might be to other intelligent species (and vice-versa). Regarding aesthetics primarily as sensory cognition and highlighting a pragmatic evolutionary backdrop provides a strong perceptual and information-processing basis on which to seek universals relevant to aesthetics. The study of aesthetics and creativity would be best served by keeping this big picture in mind as we continue to develop frameworks that extend and develop our best existing theoretical models.
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SYMPOSIUM ON ARCHITECTURE

Revered Today, Loved Tomorrow: Expert Creativity Ratings Predict Popularity of Architects 50 Years Later

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Aesthetic Qualities of Urban Spaces

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Abstract
Beginning in the 1950s, the Institute of Personality Assessment and Research (IPAR) began a program to study the psychology of effectively functioning persons. Amongst the most influential studies conducted by IPAR were the assessments of 40 highly creative architects in 1957-1961, a sample that included some of the most eminent architects of the 20th century such as Eero Saarinen, Louis I. Kahn, Philip C. Johnson, and I. M. Pei. In turn, in 2006-2007 the American Institute of Architects conducted a survey to identify America’s favorite architecture, first amongst its 2,448 members and subsequently amongst 2,214 members of the general public. Architectural creativity ratings of the architects by journal editors, expert judges, and the architects themselves predicted the popularity of their work 50 years later. In contrast, psychometric indices of divergent thinking and creativity in drawing were uncorrelated with eminence or popularity. Our results suggest that in the domain of architecture, self and expert assessments predict future popularity.

Keywords: Architect, IPAR.

Introduction
It is difficult to overestimate the contributions of the Institute of Personality Assessment and Research (IPAR) to the scientific study of creativity. Essentially, IPAR is known as the birthplace of the study of creative personality, having contributed to numerous methodological and theoretical innovations that underlie our understanding of creative persons (Helson, 1999).

IPAR’s overarching mandate was to assess effectively functioning persons, a process that necessitated the development and application of assessment techniques to study populations that fulfilled this criterion, including male and female writers, poets, mathematicians, and space scientists. However, arguably, IPAR’s study of creative architects could be considered its most well-known contribution to the study of creative persons (see MacKinnon, 1962). To enable an in-depth and holistic analysis of this population, a sample of 40 highly creative architects were invited to IPAR for assessment. This approach is considered unique for several reasons. First, the participants included some of the most eminent architects of the 20th century such as Eero Saarinen, Louis I. Kahn, Philip C. Johnson, and I. M. Pei. In this sense, one can be assured that the sample composition reflects truly creative persons. Second, the test battery was extensive, including measures of perceptual, cognitive, and intellectual abilities, interests and values, personality, and other related characteristics. Third, the
researchers collected excellent ratings of the key criterion of interest (i.e., architectural creativity) by obtaining ratings of creativity from the editors of major professional architectural journals, an independent panel of expert architects, as well as asking each participant to rate the entire sample on creativity.

Although the vast corpus of data collected in relation to creative architects cannot be summarized here, we conclude by noting two points: First, the analysis highlighted the relationship between personality factors and architectural creativity. Second, cognitive factors (e.g., intelligence), were shown to be unrelated to variations in creativity. For example, MacKinnon (1962) noted that “As for the relation between intelligence and creativity…we have found within our creative samples essentially zero relationship between the two variables” (p. 487). Interestingly, this was not due to a narrow restriction in range of intelligence, as might be expected given the relative homogeneity of the sample in terms of eminence. Specifically, mean IQ amongst creative architects was 113 on the Terman Concept Mastery Test (1956), with scores ranging from 39 to 179.

**Aims**

The present study was conducted with two aims in mind. First, the architectural creativity of the 40 architects was assessed in 1957-1961 by (a) journal editors, (2) expert judges, and (3) architects themselves. Fortuitously, almost precisely 50 years later (i.e., 2006-2007) the American Institute of Architecture (AIA) conducted a survey to identify America’s favorite architecture, first amongst its 2,448 members and subsequently amongst 2,214 members of the general public. We were interested to determine whether the three sets of creativity ratings collected at initial assessment would predict popularity of the architects’ works 50 years later—assessed as a function of the inclusion of their work in AIA’s lists.

In addition, the initial analyses conducted by IPAR researchers had shown that cognitive factors did not predict variation in creativity. However, in IPAR’s archives we were able to discover tests of divergent thinking (i.e., Alternate Uses Task) and architectural aptitude (i.e., Architectural Aptitude Test) that could be scored using novel assessment techniques unavailable at the time of initial analyses. Therefore, our second aim was to apply contemporary assessment techniques to cognitive data with an eye toward reappraising the relationship between cognitive ability and architectural creativity.

Finally, when assessing our results it is important to keep in mind that the analyses concern the covariation between various variables of interest among 40 highly creative architects. Notably, IPAR researchers also collected considerable data from two other samples: 43 architects who had worked in the same firms as the 40 highly creative architects, as well as a representative sample of 41 Architects who had not worked in those firms. Unfortunately, those samples were not administered the tests that are the focus of the present study (i.e., Alternate Uses Task, Architectural Aptitude Test, and the Terman Concept Mastery Test).

**Method**

The present study involved the reanalysis of archival data collected by IPAR architects in 1957-1961. The archives are currently managed by the Institute of Personality & Social Research (IPSR) at the University of California Berkeley. Permission to access the data was granted by IPSR following the approval of a proposal submitted by OV in 2011.

**Participants**

The 40 IPAR architects were exclusively male. Average age at time of assessment was 49 years ($SD = 7.13$, range 31-63). They were asked to rate their general health using a 4-point ordinal scale, and the following represents the frequencies per level: Excellent (27), good (12), fair (1) or poor (0), $\chi^2 (2) = 25.55$, $p < .001$.

**Materials**

The data used for analysis here involve two different sources: data collected from the architects at IPAR in 1957-1961, and (b) the surveys conducted by AIA in 2006-2007 and published in 2007. These sources are discussed in turn.

**IPAR data** Considerable data were collected from the architects at IPAR. Here we focus on the following 4 types of data. First, divergent thinking ability was assessed using the Alternate Uses Task (Guilford, 1967), in which participants were given 13 minutes to generate unusual uses for the following 6 common objects: An automobile tire (used on the wheel of an automobile), a key (used to open a lock), a safety pin (used for fastening), a watch (used for telling time), a button (used to fasten things), and eyeglasses (used to improve vision). Second, architectural ability was assessed using the Architectural Aptitude Test (1956). This multi-component test battery was developed to enable the prediction of academic success in architecture school. For present purposes we focused on a specific subtest within the battery that assesses the participants’ drawing ability. Specifically, the participants were given a series of identical boxes, within which 2 lines were drawn (Figure 1). They were instructed to incorporate those 2 lines into any drawing of their own making, and to label their creations. It was explicitly brought to their attention that this was not a test of drawing skill, and that the drawings could reflect any subject matter of their own choosing. They were given 10 minutes to complete as many drawings as possible, and instructed to work as fast as possible. Third, intelligence was assessed using the Terman Concept Mastery Test (1956). We were primarily interested in including intelligence scores as control variables in our analyses.
Figure 1: Top: A test item from the drawing subtest of the Architectural Aptitude Test. Bottom: Representative drawings rated as “creative” (lovers) and “not creative” (shed) by a panel of two judges.

IPAR researchers also collected three sets of creativity ratings for each participant. First, each of the participants was instructed to rate 125 architects—comprised of the 40 eminent architects as well as the 85 included in the two control conditions (see description above)—on architectural creativity. The 7-point rating scale ranged from 1 (lowest rating on creativity) to 7 (highest rating on creativity). Importantly, the instructions emphasized that “In making your ratings the reference population is the entire profession of practicing American architects, not just the 125 listed here.” Second, each architect was rated on architectural creativity by 5 editors of leading architecture journals and magazines (AIA Journal, Progressive Architecture, etc.) using the same 7-point rating scale. Third, a 5-member panel of experts in architecture rated each participant on architectural creativity, also using the same 7-point rating scale.\(^{12}\)

AIA data The AIA data consisted of the results of the survey on America’s favorite architecture published on the 150th anniversary of AIA in 2007. Specifically, we examined whether structures designed and/or built by any of the 40 architects was included on either of the two lists. Specifically, the first list included 248 structures identified by AIA members as their “favorite” structures. Specifically, each respondent was asked to name up to 20 of his or her favorite structures in any of 15 predefined categories of building. The list of 248 structures was selected because each structure within it was identified by a minimum of 6 AIA members. Subsequently, a pictorial list of these structures was administered to the general public, who rated each structure on “likeability.” Examining each list separately is important because the list of 248 buildings represents the attitudes of respondents with more experience and/or formal training in architecture, whereas the list of 150 buildings represents the attitudes of laypeople who might not necessarily have such experience and/or formal training in architecture. America’s 150 favorite pieces of architecture was the outcome of this survey (http://www.npr.org/documents/2007/feb/buildings/150buildings.pdf).

Results and Discussion

We began our analysis by investigating the correlations of architectural creativity ratings amongst journal editors, expert judges, and the architects themselves. Perhaps not surprisingly, the results demonstrated high correlations across the board (Table 1).

Table 1: Correlations of architectural creativity ratings amongst journal editors, expert judges, and the architects.

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<th>Editors</th>
<th>Experts</th>
<th>Architects</th>
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<tbody>
<tr>
<td>Editors</td>
<td>–</td>
<td>.63*</td>
<td>.89*</td>
</tr>
<tr>
<td>Experts</td>
<td>–</td>
<td>–</td>
<td>.64*</td>
</tr>
<tr>
<td>Architects</td>
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Notes. \(* = p < .001.\)

Next, we set out to test the hypothesis that the three sets of creativity ratings collected at initial assessment would predict popularity of the architects’ works 50 years later—assessed as a function of the inclusion of their work in AIA’s lists. For each predictor (i.e., journal editors, expert judges, and architect ratings) we ran two separate binary logistic regressions, corresponding to inclusion in the list of 248 or 150 structures. In each case the dichotomous criterion was inclusion (i.e., presence vs. absence) of each architect’s work on the list. The results demonstrated that architects’ creativity ratings were a significant predictor of inclusion in the AIA membership’s list of 248 favorite buildings (\(\beta = .64, p < .05\)), as well as the general public’s list of 150 favorite pieces of American architecture (\(\beta = .31, p < .05\)). Similarly, the expert judges creativity ratings were a significant predictor of inclusion in the AIA membership’s list of 248 favorite buildings (\(\beta = .64, p < .05\)), as well as the general public’s list of 150 favorite pieces of American architecture (\(\beta = .31, p < .05\)). Finally, the journal editors’ creativity ratings were a significant predictor of inclusion in the AIA membership’s list of 248 favorite buildings (\(\beta = .33, p < .05\)), as well as the

\(^{12}\) A fourth set of ratings collected from professors of architecture have also been obtained and will be analyzed.
general public’s list of 150 favorite pieces of American architecture ($\beta = .19$, $p < .01$). In conjunction, our results demonstrate that creativity ratings by experts in a field are good predictors of future popularity, both amongst professionals within the field as well as laypersons.

Our second aim was to apply contemporary assessment techniques to cognitive data with an eye toward reappraising the relationship between cognitive ability and architectural creativity. We approached this question from a number of different perspectives, beginning with a focus on data from the Alternate Uses Task (Guilford, 1967). All 40 participants completed this task. Traditionally, this task is scored using three indices: Fluency (i.e., number of generated responses), flexibility (i.e., number of categories of responses), and originality (i.e., statistical infrequency of responses). To compute flexibility two independent judges rated the number of categories that were generated in response to each item (i.e., an automobile tire). Inter-rater reliability at the item level was satisfactory (Cronbach’s alpha = .76). We therefore averaged the scores across the two judges to create a single index of flexibility. Fluency, flexibility, and originality scores were correlated (Table 2). However, fluency, flexibility, and originality scores were not correlated with journal editors’, expert judges’, or the architects’ architectural creativity ratings. Furthermore, they did not predict placement in the AIA membership’s list of 248 favorite buildings or the general public’s list of 150 favorite pieces of American architecture.

We next applied two contemporary assessment techniques to scoring responses from the Alternate Uses Task (Guilford, 1967). The first involved a subjective assessment approach to rate responses on creativity (Silvia et al., 2008). Specifically, three independent judges assigned a “snapshot” creativity score to the entire set of uses generated in responses to each prompt (Mouchiroud & Lubart, 2001). Inter-rater reliability was satisfactory (Cronbach’s alpha = .72). We therefore averaged the ratings across all judges and prompts to compute a single snapshot creativity score for each participant. In addition, the same three judges also rated each individual item (i.e., response) on creativity. As can be seen in Table 2, both snapshot creativity is correlated with fluency, flexibility, and originality. Although not shown here, the same is true of item-level creativity. However, neither snapshot creativity nor item-level creativity correlated with journal editors’, expert judges’, or the architects’ architectural creativity ratings, nor did they predict placement in the AIA membership’s list of 248 favorite buildings or the general public’s list of 150 favorite pieces of American architecture.

The second contemporary approach to scoring the Alternate Uses Task involved the computation of the creativity quotient (CQ), which is a mathematical expression derived from information theory that accounts for the number of ideas (i.e., fluency) as a function of the number of categories (i.e., flexibility) (Snyder, Mitchell, Bossomaier & Pallier, 2004). Although CQ was correlated with other psychometric measures of creativity (Table 2), it did not correlate with journal editors’, expert judges’, or the architects’ architectural creativity ratings, and nor did it predict placement in the AIA membership’s list of 248 favorite buildings or the general public’s list of 150 favorite pieces of American architecture.

The final set of analyses involved assessment of the creativity of the drawings from the Architectural Aptitude Test. Data were available from 38 participants. Each drawing was rated on creativity by two independent judges using a 3-point scale (0 = not at all creative, 2 = somewhat creative, 3 = extremely creative). Inter-rater reliability at the item level was satisfactory (Cronbach’s alpha = .89). In addition, the same two raters also assigned a snapshot score—in this case defined as one rating given to the entire set of drawings by each participant. Inter-rater reliability at the snapshot level was satisfactory (Cronbach’s alpha = .91). Averaged item and snapshot ratings were correlated ($r_{36} = .86$, $p < .001$, suggesting that snapshot ratings are likely informed by the perceived creativity of individual items. Furthermore, neither snapshot ratings nor averaged item ratings were correlated with journal editors’, expert judges’, or the architects’ architectural creativity ratings, nor did they predict placement in the AIA membership’s list of 248 favorite buildings or the general public’s list of 150 favorite pieces of American architecture.

### Table 2: Correlations among psychometric measures of creativity.

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Notes. * = $p < .001$, # = $p < .05$. Flu = fluency, Flx = flexibility, Org = originality, CQ = creativity quotient. Sub = creativity rating of Alternate Uses Task (snapshot), Apt = creativity rating of drawings in the Architectural Aptitude Test (snapshot).

### Conclusion

This study was conducted with two aims in mind. First, we were interested in determining whether the architectural creativity of the 40 eminent architects assessed in 1957-1961 by journal editors, expert judges, and architects themselves would predict the popularity of their works 50 years later—assessed as a function of the inclusion of their work in either of AIA’s lists. Indeed, our results demonstrated that in all three cases architectural creativity ratings were predictive of future popularity. This is a remarkable finding because it is not unreasonable to assume that the expert judgments made in 1957-1961 were likely based on different criteria than the popularity ratings collected in 2006-2007 by AIA. Nevertheless, even within a small sample of highly eminent architects, perceived creativity is predictive of future
likeability among relatively more and less experienced viewers of the work (i.e., AIA members and laypersons respectively).

Second, we found no correlation between psychometric indices of divergent thinking—whether scored using standard or updated procedures—or creativity ratings of drawing with ratings of architectural creativity in 1957-1961 or popularity in 2006-2007. One explanation for this might be that whereas psychometric indices of divergent thinking and creativity differentiate between eminently creative and uncreative persons, they might not discriminate between relative gradations of eminence. Another explanation might be that the specific tests considered thus far might not be diagnostic, whereas other psychometric indices of divergent thinking and creativity might very well correlate with relative eminence and/or popularity. Indeed, further reanalysis of the available archival data will be conducted to address this latter possibility.

Acknowledgments

We are very grateful to the Institute of Personality and Social Research (IPSR) at the University of California Berkeley for granting of generous access to the IPAR data.

References


Perception of Virtual Residential Walkthroughs

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Abstract
Real estate firms use virtual residential spaces (virtual walkthroughs) in a video format as a supplement in the advertising of their properties. Societies’ emotional and evaluative reactions to walkthroughs are unknown and something this study seeks to address. This experiment looks at two types of walkthrough designs: warm (personal adornment - stimulating) and cool (austere and modern). Forty-eight participants were presented with 8 virtual residential walkthroughs (4 warm, 4 cool) in randomized order in a two-part experiment. In Part 1, participants rated each of the walkthroughs on 13 rating scales appraising essential qualities previously found to be desired in homes and an estimation of duration for the walkthrough videos. In Part 1 participants wrote short story outlines set in 4 video walkthroughs (2 warm and 2 cool) in either the first person (Self) or the third person (Other) perspective. Participants responded to warm and cool virtual walkthroughs in different ways. A relationship was found between the quantitative and qualitative data; the emotional responses evoked in Part 1 was related to how participants wrote, rated and projected themselves and others onto their narrative in Part 2.

Keywords: virtual walkthroughs; interior design; residential spaces

Introduction
Architectural walkthroughs have been among the most cited applications of Virtual Reality and has become a regular feature in the presentation of architectural design projects. Visual Walkthroughs in a video medium are made using 3D technology and are used in the creation of realistic virtual buildings. They are full motion videos of a space at a walking pace. With the rapid development of the real estate industry, more and more consumers want to stay at home and view potential lived spaces online. Virtual walkthroughs enable customers to have an immersive experience in the spaces of their interest.

In everyday life, home interiors can serve a symbolic function, providing clues for others about the identity, social class, aesthetic preferences, personality traits, and personal histories of their occupants (Sadalla, Vershure, & Burroughs, 1987; Ritterfeld, 2002). Research has shown that defining a home is comprised of several core concept in which people consider essential, they include social relationships, privacy, personalization, relaxation, freedom, safety and warmth, these features are absent in spaces which were not regarded as home (Hayward 1977; Smith 1994). It is yet to be determined whether perceiving a novel space as expressive of the essential home characteristics influences emotional reaction, cognitive processing and the choice purchase.

No formal empirical studies have yet been conducted on the emotional, evaluative and projected reactions to virtual residential walkthroughs. However, several studies have previously studied connotative qualities (e.g. warm – cool) spaces and the related affective processes involving emotional reactions and evaluations of these spaces. The facilitative effects of an evocative atmosphere were demonstrated in three studies on imagined social episodes set in novel living and dining rooms. In the first study (Ritterfeld & Cupchik, 1996), comfortable living and dining rooms that looked “lived in” were judged to be “warmer” than sparsely furnished modern, geometric rooms, which were experienced as “cool,” revealing little about their inhabitants’ inner feelings. In the second study (Cupchik, Ritterfeld, & Levin, 2003), participants recognized incidental details (e.g., table lamp, fireplace) selected from “warm” rooms when they imagined being personally engaged in social episodes set in them. In contrast, it was easier for participants to recognize details from the “cool” modern rooms when they adopted a detached attitude and imagined episodes involving the original inhabitants. The third study (Cupnik, Hilscher, & Buttu, 2010) looked at the effects of a welcoming (i.e., warm) or distancing (i.e., cool) visual environment and the merging of these spaces with pleasant and unpleasant odors through the mediation of engaged or detached narrative viewpoints. Results suggested that participants recognized odors that fit with their imaged scenes.

Color and its interaction with design can have a significant effect of whether a space is interpreted as warm or cool in atmosphere. Lee and Lee (2006) developed an emotion model based on color combinations in interior coordination. This emotion model consists of three axes named as ‘soft–hard’ (first dimension), ‘light–heavy’ (second dimension) and ‘splendid–sober’ (third dimension). This emotion model had a one-to-multiplicity correspondence structure between the color combination and the emotion descriptor. This emotional model was examined using residential interior spaces. This study shed light on the interactive relationship between emotion–descriptor, color combination and design concepts.

Based on findings of Cupnik, Hilscher, and Buttu, (2010), Lee and Lee (2006), Cupchik, Ritterfeld, and Levin, 2003 and Ritterfeld and Cupchik, (1996) two categories of virtual walkthroughs were developed: Warm virtual walkthroughs (personal adornment - stimulating) and cool virtual walkthroughs (austere - modern). The goal of this study is to understand how people respond to virtual presentations of
lived spaces, how they see themselves in relationship to these spaces and how they imagined themselves being in these spaces. Understanding this may help in the development more effective walkthroughs and in the marketing and utility of virtual residential spaces.

**Methods**

**Overview**

The experimental paradigm involved two parts in which subjects were presented with 8 virtual residential walkthroughs in randomized order. Part 1 of the experiment was designed to test the emotional expression that each video elicits in terms of essential qualities of a home along with a time estimation measure of how absorbed subjects were in each video. Part 2 of the experiment asked participants to write a short story outline about an event that could take place in 4 video walkthroughs of their choice (2 warm and 2 cool walkthroughs) in either first person (Self) or third person (Other) perspective. The purpose for Part 2 of the experiment was to look at how persons projected narratives about themselves and others on to the spaces depending on Room Type.

**Subjects**

Forty-eight undergraduates from the University of Toronto, which included 24 males and 24 females, participated in this experiment.

**Materials**

Walkthroughs were selected based on the characteristics of interior spaces found in Cupnik, Hilscher, and Buttu, (2010), Lee and Lee (2006), Cupchik, Ritterfeld, and Levin, 2003 and Ritterfeld and Cupchik, (1996). The warm virtual walkthroughs were chosen to be: causal, curvaceous, include personal adornment, and yellow or red centered in color scheme. The cool spaces were characterized by a futuristic design, high-tech, unique, geometric, austere, and spacious and a blue centered color scheme.

The stimulus materials comprised of two matched sets of 4 warm and 4 cool residential walkthroughs that were initially chosen from YouTube.com. The chosen walkthroughs were edited using Final Cut Pro to create consistency between all videos in duration, watermarks, and camera speed. Each of the 4 cool videos where paired with one warm video to have the same duration. The videos ranged in length from 43 seconds to 2 minutes and 34 seconds.

Initially, 20 residential walkthroughs were pretested for the level of warm and cool atmosphere they projected to their viewers. The 4 videos with the coolest and warmest atmospheres were selected to be included in this study (see Figure 1 for an example screen shot).

![Screenshot of a warm walkthrough (a) and cool walkthrough (b)](image)

**Figure 1:** Screenshot of a warm walkthrough (a) and cool walkthrough (b)

The study was run on Adobe Reader X with all videos, rating scales and spaces for written responses were embedded into the PDF file.

**Design**

A 2x2 design with replication was used in Part 1 with the dependent measures of:

- **Walkthrough Rating Scales** – based on Hayward (1977) and Smith (1994) description of the essential qualities of a home, a 13-item 7 point scales was developed with the following scales:
  - “How beautiful is this space for you?”
  - “Is this space primarily warm or cool for you?”
  - “How much does this space stimulate your imagination?”
  - “How familiar does this space feel to you?”
  - “Would you prefer to live in or visit this space?”
  - “How relaxed or tense does this space make you feel?”
  - “Is it easier to imagine yourself alone in this space, or socializing with others in this space?”
  - “How engaged or detached did you feel while moving through the space?”
  - “How secure and safe does this space make you feel?”
  - “How free would you feel to express yourself in this space?”
  - “How much privacy do you feel that you would have in this space?”
  - “Does this space evoke any memories for you?”
  - “To what extent do you think that you can personalize this space?”

- **Time estimation error**

2x2x2 design was used in Part 2 with the dependent measures:
- Qualitative story analysis - stories were probed for words, sentences, nouns or verbs that fit into specific frequently themed categories
- **Story Writing Experience Rating Scales** - consisted of five questions on a 7 point scale:
  - “How difficult or easy was it to write this story outline?”
  - “How resolved was this story outline (how much did the problem work out at the end)?”
  - “How unpleasant or pleasant was the theme of your story outline?”
  - “How much did your experience of the space shape your story outline?”
  - “Does your story remind you of earlier episodes of your life?”

The between-subjects variables in this study included gender and the within-subject variables included Room Type (cool or warm) and Story Perspective (Self or Other). The Room Type and Story Perspective set was counterbalanced with the order presentation of the videos.

**Procedure**

**Part 1** Subjects were instructed to watch each video and answer the 14 questions that followed. Subjects were instructed to remove any devices on themselves that displayed the time during the experiment.

**Part 2** The participants were shown 4 pairs of warm and cool videos and were instructed to pick one video from each pair to re-watch. They were told to imagine a story that may have taken place in the walkthrough in either in the first-person perspective (Self) or third-person perspective (Other). Subjects were given 8 minutes to write each story; at the end of the 8 minutes subjects were instructed to continue onto the next video. After subjects had written their story outline for each video, they answered 5 questions on their story writing experience.

**Statistical analysis**

All statistical analysis was conducted using SPSS. Quantitative and qualitative approaches to data analysis were used in a complementary manner. Analyses of variance (ANOVA) were performed to assess the impact of the independent variable (Room Type) on the quantitative scales (Walkthrough Rating Scales and Story Writing Experience Rating Scales). A factor analysis using a principal components analysis (PCA), with Varimax and Kaiser Normalization was applied to the rating scales in Parts 1 and 2 and the numerical category data to uncover relationships between the three. The Pearson product-moment correlations were also used to determine the relationship between the factors obtained for Parts 1 and 2 of the study. A qualitative content analysis was implemented for the content obtained from the story narratives in Part 2, which included recording the frequency of words that were representative of categories, which were found to be patterned themes in the narratives.

**Results**

**Quantitative Data**

**Part 1 Walkthrough Experience** A series of ANOVAs were conducted for each of the 14 scales to assess participants’ responses to the independent variables. The ANOVA included the within-subject variables of Room Type (cool and warm) and the between-subjects variables of gender. The Room Type yielded significant main effects on the Walkthrough Rating Scales. Results showed that warm walkthroughs in comparison to cool walkthroughs were judged to be warmer, $F(1, 46) = 133.13, p < .001$, more familiar, $F(1, 46) = 54.50, p < .001$, relaxing, $F(1, 46) = 16.38, p < .001$, secure, $F(1, 46) = 18.75, p < .001$, private, $F(1, 46) = 4.80, p < .05$ and evoked more personal memories, $F(1, 46) = 28.78, p < .001$. Results also showed that that on average everyone overestimated the duration of the walkthroughs regardless of room type. No significant difference was found between warm and cool walkthroughs in relation to: personalization; freedom; attachment/detachment; socialization; wanting to live or visit the space; imagination and beauty.

**Part 2 Story Writing Experience** A series of ANOVAs were performed to determine how Room Type affected the ratings on the five-item Story Writing Experience Rating Scales. The ANOVA included gender as a between-subjects variable and Room Type and narrative perspective (Self or Other) as within-subject variables. Two significant main effects were found between narrative perspective comparing Self and Other and the Story Writing Experience Rating Scales. It was found to be significantly easier to write the story from the Self than the Other perspectives, $F(1, 46) = 6.80, p < .05$. A second significant main effect was found on whether the narratives reflected episodic memories, as would be expected, results showed that people had more episodic memories in the Self than the Other conditions, $F(1, 46) = 10.98, p < .05$.

![Figure 2: Interaction between Story Perspective and Room Type in relation to resolution of story narratives](image-url)

A significant interaction was found between Story Perspective and Room Type in relation to resolution of the story, $F(1, 46) = 4.93, p < .05$. As exhibited in Figure 2,
results show that stories were more resolved when written from the Self compared to the Other perspective in cool rooms. However, in warm rooms, stories were more resolved in the Other than the Self perspective. No significant effect was found for Room Type on subject’s narratives.

Walkthrough Rating Scales

Factor Analysis A factor analysis was performed to examine the correlations between the 13 different items on Walkthrough Rating Scales. Based on a review of the item loadings produced by preliminary exploratory PCA, 3 items were deleted from the final analysis because they did not contribute in a significant manner. The items either had weak loadings (less than .50), or cross-loaded on the components thereby failing to distinguish between different dimensions. Based on Varimax rotation, four factors were extracted with Eigenvalues greater than 0.50. Together, factors accounted for 69.12% of the variance.

Factor One reflects a Carefree Dimension based on 4 items (22.91% of variance): “How free would you feel to express yourself in this space?” (.85); “How secure and safe does this space make you feel?” (.85); “How much privacy do you feel that you would have in this space?” (.79); and “How relaxed or tense does this space make you feel?” (-.75).

The second factor (21.62% of variance), Aesthetic Dimension, included 5 items: “How beautiful is this space for you?” (.80); “How much does this space stimulate your imagination?” (.77); “Would you prefer to live in or visit this space?” (-.75); “How engaged or detached did you feel while moving through the space?” (-.74), and “To what extent do think that you can personalize this space?” (.56).

The third factor (16.3% of variance), Recollection Dimension, included 2 items: “Does this space evoke any memories for you?” (.90) and “How familiar does this space feel to you?” (.84).

Story Writing Experience Rating Scales

Factor Analysis. A factor analysis of the Story Writing Experience Rating Scales using the Varimax rotation yielded 2 factors with eigenvalues greater than 0.5 accounting for 67.83% of the variance.

The first factor, Spatial Influence Dimension, (34.97% of variance) included 3 items: “How much did your experience of the space shape your story outline?” (.85); “Does your story remind you of earlier episodes of your life?” (.77); and “How resolved was this story outline (how much did the problem work out at the end)” (.63).

The second factor, Writing Experience Dimension (32.91% of variance), included 3 items: “How difficult or easy was it to write this story outline?” (.86); “How unpleasant or pleasant was the theme of your story outline?” (.81); “How resolved was this story outline (how much did the problem work out at the end)” (.51).

Qualitative Data

Eleven qualitative categories were derived to represent the trends present within the story narratives participants wrote about each walkthrough. The story narratives were content analyzed to detect their major thematic, emotional and cognitive patterns. Trends that appeared in varying degrees across many of the narratives were defined as categories that were then quantified through a frequency count for each category. In addition to word count, the 10 categories included: positive emotion, negative emotion, negative evaluation, positive evaluation, neutral descriptions, non-social actions, actions not in space, autobiographical details, and background information.

Factor Analysis of Story Narratives A Varimax rotation factor analysis of the frequency of words grouped into 11 categories was conducted. Four factors were extracted with eigenvalues greater than 0.5 accounting for 70.26% of the variance.

The first factor represents the Personal Experience Dimension, (21.45% of variance) which included 4 items: Neural description (0.88); non-social action (0.87); word count (0.64) and positive emotion (0.57).

“Everything is still and silent. Suddenly, a man’s head pokes out over the balcony. He quickly surveys the home, and then a smile breaks out over his face when he realizes that it is empty....”

The second factor represents the Social Experience Dimension (20.91% of variance), which includes 4 items: Social action (0.81); negative emotion (0.75); actions outside of space (0.69); and word count (0.59).

“It was a Friday night and my friends had called me up to go to a party. I arrived around 8 o’clock. There were already a lot of people at the party and loud music was playing in the background. Everything seemed to be good, everyone was having fun and chatting about. I glanced across the room and I saw a guy that seemed suspicious. I asked my friend who he was and she didn't know. I thought that it was a little strange that the host didn't know who he was either. Later that night, that man began to argue with a lady in a red dress. He started yelling and one of my friends went in to ask what was going on and then intervened. The stranger shoved my friend and they began to fight. Apparently the neighbor’s upstairs thought that the party was getting too loud and they decided to call the police....”

The third factor is the Episodic Context Dimension (16.17% of variance), which includes 2 items: background information (0.84) and autobiographical information (0.73).

“Seventh Street High school has just finished their term and a fresh batch of graduates are approaching their third phase of their life, university. Before the storm, a couple named Chelsea and Dixon decided to go on a graduation trip the unexpected schedule of University. They
choose the Swiss Alps. Arguably one of the most
gorgeous places for sight seeing and outdoor
activity. Conveniently, Dixon is from Switzerland.
His family has been in the local watch company,
Swatch, for 4 generations. They owned a
dozen properties around the area. Which saved them
the cost of hotels when it came down to visiting
Switzerland."

The fourth and final dimension is the Expressiveness
of Space Dimension (11.73% of variance), which includes 2
items: negative evaluation (0.77) and positive evaluation
(0.67).

“When Carol entered the house she did not like
the layout of the house. She thought to herself this is
not the house she expected to see. She started to look
for something which takes her attention. She passed
the hall way. The only thing which impressed her
was the big window at the end of the room. She
decided to visit up stairs. There should definitely be
some thing there to make her excited. She went to
the bedroom, yes there it was, her dreamed bedroom.”

Correlations
Pearson product moment correlations was calculated in an
effort to find relationships between the 4 factors obtained
from the Walkthrough Rating Scales in Part 1, the 2 factors
from the Story Writing Experience Rating Scales and 4
factors from the qualitative analysis of narratives found in
Part 2. Two significant correlations were found between
factors in Parts 1 and 2 of the study. A correlation was found
between Factor 1 Carefree Dimension in the Walkthrough
Rating Scales in Part 1 and Factor 2 Writing Experience
Dimension in the Story Writing Experience Rating Scales in
Part 2, \( r(47) = 0.34, p < .05 \). Therefore, if participants felt
more relaxed, secure, free and private in the space, it became
easier to write a narrative and to write a pleasant narrative in
the walkthroughs. A significant correlation was also found
between Factor 3 Recollection Dimension in the Walkthrough
Rating Scales Part 1 and Factor 1 Special Influence
Dimension of Story Writing Experience Rating Scales in Part
2, \( r(47) = 0.31, p < .05 \). Therefore, it suggests that if
participants found that the space brought back memories and
was familiar in Part 1, the stories they wrote in Part 2 were
more likely to be resolved, shaped by the space and remind
them of an earlier memory in their lives.

A positive correlation was also found between Factor 1
Spatial Influence Dimension in the Story Writing Experience
Rating Scales and Factor 4 Expressiveness of Space
Dimension in the qualitative analysis of the story narratives
in Part 2, \( r(47) = 0.28, p < .05 \). This suggests that, if subjects
rated that the space shaped their story, reminded them of their
own life, and was a more resolved narrative, then the more
evaluation words (positive and negative) were used in the
content of their stories.

Discussion
This study successfully looks at peoples emotional and
evaluative responses to warm and cool virtual video
walkthroughs. The central inquiry of this investigation is to
determine if a distinctive interpretation and emotional
response is exhibited from the viewer depending on
walkthrough style (Room Type); this was looked at both in a
quantitative and qualitative manner.

Our results suggest that participants responded to warm
and cool virtual walkthroughs in different ways; warm
walkthroughs, in comparison to cool walkthroughs, were
judged to be significantly warmer, familiar, relaxed, secure,
private, and evoking more personal memories. These
characteristics where judged as positive features of homes
(Smith 1994; Hayward 1977). The lack of warm atmosphere
is considered by many to inhibit the feeling of a home while
many described the atmosphere of places lacking a warm
ambiance as stiffening, restricting, and being afraid to move,
lack of security, lack of ownership (Smith, 1994). Therefore,
it is not surprising that warm atmospheric walkthroughs tend
to elicit more inviting and contented qualities in an individual
compared to cool walkthroughs.

Warm walkthroughs are personalizing spaces that appear
lived in, while, cool walkthroughs (minimalistic, geometric,
saturated color scheme and austere) are typically designed as
a blank canvas that are ready for potential clients to mentally
personalize while going through the space. This strategy is
used to refrain from giving a particular ethos to the
atmosphere, leaving more room for creativity, imagination,
and personalization. It is thought that since there are differing
preferences and utilities for a space, abstaining from giving a
space character will enable clients to project themselves more
freely onto the space. However, contrary to popular belief our
results show that no such significant difference exists
between warm and cool walkthroughs in relation to
personalization, freedom, imagination and beauty. Therefore,
consciously it appears that warm and cool walkthroughs are
similarly interpreted in relation to personalization, freedom,
and imagination and that cool walkthroughs do not have an
advantage when it comes to these qualities.

Results obtained from Part 2 revealed that perspective
plays an important role in narratives written in walkthrough
spaces. Stories written in the engaged (Self) condition were
significantly easier to write and evoked more episodic
memories from the subject’s past compared to detached
(Other) condition evaluated using the Story Writing Rating
Scales.

Additionally, a significant interaction was found between
Story Perspective and Room Type in relation to resolution of
the story from the Story Writing Rating Scales. Stories were
found to be more resolved in the cool rooms when written in
the Self perspective compared to Other. However, stories were
found to be more resolved in the warm rooms when
written in the Other perspective compared to the Self. This
distinction maybe attributed partially to the actor observer
phenomenon that proposes people in the Other perspective
focus outwardly and attribute cause to the setting, whereas
those in the Self perspective focus inwardly and implicate the self in causal accounts. Moreover, Self condition poses a more complex psychological situation in warm spaces compared to that of the Other condition due to warm spaces being a more stimulating environment. This complexity may lead to more difficulty in resolving the story in warm walkthroughs written from the Self perspective. Conversely, cool walkthroughs are austere, highly structured, open and lack abundant environmental stimulation. This simplicity in the environment allows for more effective focus on the complexity of issues brought on by the Self condition. It gives subjects the opportunity to effectively resolve the projected issues without environmental distractions. On the other hand, the Other condition uses the environmental clues for character construction and situational inspiration, this becomes limited in cool walkthroughs since it reveals the least about their inhabitants. Additionally, cool walkthroughs can characterized by their unfamiliar, stiff, and insecure atmosphere, therefore, it can be postulated that effectively resolving conflict in a somewhat intimidating atmosphere with limited information becomes a challenge in cool environments. This challenge may lead to the difficulty of effectively resolving conflicts in cool spaces in the Other condition.

The correlations showed a relationship between the ratings of the walkthroughs in Part 1, the ratings in the narratives and the qualitative analysis of the narratives in Part 2. Therefore, if participants felt more relaxed, secure, free and private in the space in Part 1 it became easier to write a narrative and to write a pleasant, resolved narrative in the walkthroughs in Part 2. These results demonstrate the significant effects design can have on evoked emotions both at a conscious and unconscious level. If a space is interpreted as free, secure, private and relaxed consciously, unconsciously feeling of resolution and pleasantness are evoked. It is important to point out that security, privacy and relaxation are qualities that have been significantly attributed to warm walkthroughs therefore it maybe suggested that warm walkthroughs maybe unconsciously associated with feelings of pleasantness and resolution.

It was also found that if participants felt the space brought back memories and was familiar in Part 1, the stories they wrote in Part 2 were more likely to be resolved, shaped by the space and remind them of an earlier memory in their lives. Thus, if a walkthrough evokes a conscious sense of familiarity in Part 1 when it came to writing the stories in Part 2 this familiarity was projected onto the stories, resulting in an unconscious feeling of resolution and tendency to use this familiar space more profusely in shaping their stories.

Correspondingly, in Part 2 a correlation was also exhibited between the subjects rating the space shaping their story, reminding them of their own life, and a more resolved narrative, with the frequency of evaluation words were used (positive and negative) in describing the space in their narratives. These evaluations (being impressed or not being impressed) demand deeper affective processing which require a judgment to be made and a conclusion to be drawn. It is postulated if a new space reminds you of an earlier episode of your life and evokes a sense of familiarity, unconsciously one begins to compare the memory and appraisals of the old space to that of the new space. This unconscious comparison leads to evaluative judgments of the space which maybe positive or negative depending on the appraisal of the recollection. It maybe assumed that since warm spaces are evaluated to be more familiar and evoke more personal memories, unconsciously they tend to be evaluated with judgment as opposed to cool unfamiliar spaces. Cool spaces may not evoke memories, making them less prone to critical judgment (positive or negative).

In summary, this study found that warm virtual walkthroughs tend to adhere more closely to the characteristics found to be essential qualities that define a home environment. The analysis of story narratives revealed that stories were more resolved in the cool spaces when written in the Self-perspective compared to Other. However, stories were found to be more resolved in the warm rooms when written in the Other perspective compared to the Self. This distinction maybe attributed partially to the actor observer phenomenon. Several relationships were found between emotional responses evoked in Part 1 and in the approach participants took in their narratives in Part 2. Indication of deeper processing was present leading us to suggest that warm familiar spaces maybe more disposed to to evaluative judgments as opposed to cool unfamiliar ones.

References


A Computational Analysis of Pareidolia-Derived Emotional Messages in Architecture

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Abstract
The psychological phenomenon wherein the human mind recognizes particular images in otherwise unrelated visual stimuli is called the pareidolia effect. The most common type of pareidolia is the identification of illusory face-like forms that, through their geometric configuration, are able to suggest emotions. While the majority of examples of facial pareidolia are identified in landscapes, clouds or other natural forms, an architectural façade can also trigger the pareidolia effect. The present paper demonstrates a way of investigating facial pareidolia in architecture. The research employs software that has been trained using a database of human faces to identify the presence of face-like forms in a building façade and then classify these forms by their emotional expressions. In the paper this method is demonstrated in an analysis of the emotions expressed by facial pareidolia detected in the southern façades of two famous twentieth century houses; the Robie House and the Villa Savoye.

Keywords: Architecture; Pareidolia detection; Emotion classification.

Introduction
Throughout history there have been many accounts of people feeling unexplained and immediate emotional responses to architecture (Casakin & Mastandrea, 2009; Di Palma, 2002). From the dread associated with ‘haunted’ houses to expressions of pleasure triggered by the rooftlines of rustic cottages, the idea that a building can evoke an emotional response is a widely accepted, but poorly understood part of everyday life (Burroughs, 2009; Pallasmaa, 2005). The dominant theories used by architects to explain intuitive responses to buildings rely on either phenomenology or environmental psychology to account for how the mind ‘reads’ and then ‘responds’ to a façade. Yet, neither of these theories can explain many of the seemingly irrational emotional readings of buildings that have been recorded throughout history (Barrett, 2006; Hendrix, 2006; Vidler, 1992). The present paper examines a new explanation of this architectural phenomenon that is derived from a growing scientific awareness of the impact of the pareidolia effect on the human mind.

The pareidolia effect is a mental process that is triggered when certain combinations of shapes or forms lead the human mind to identify the presence of something, typically a face, that is not actually there. Moreover, once such a face has been sensed, the mind automatically assigns an expression to that face and then subconsciously responds to that expression. Thus, simplistically, a facial pareidolia that expresses happiness may provoke an involuntary smile, or a pareidolia that is angry, may cause an otherwise unexplained sense of consternation. While the scientific evidence for the pareidolia effect is still being gathered and assessed, it offers one possible explanation for why some gothic structures have been described as threatening and some modern houses are considered disdainful and even why ‘a room with a view’ is emotionally appealing (Curl, 1973; Panksepp, 1998; Rieth, Lee, Lui, Tian & Huber, 2011).

In this paper software is used to identify the presence of facial pareidolia in the south façades of two canonical works of twentieth century architecture and then determine what emotions these pareidolia are communicating. The results are developed using computer simulations of the two building façades rendered under different diurnal and seasonal lighting conditions.

The two façades are from the Robie House (1908) in Chicago (USA) by Frank Lloyd Wright and the modernist Villa Savoye (1928) in Poissy (France) by Le Corbusier. Both houses have been the focus of previous accounts of intuitive emotional responses and each represents a specific type of architecture that has been subject to criticism on the basis of emotional response. For example, a ‘common indictment of modern architecture’ is that it has a ‘blank’ face or ‘vacant’ expression which evokes a negative emotional response (Porter, 2004). In contrast, the conventional pitched roof house, with its central chimney and wide eaves, is thought to suggest a more neutral or positive set of expressions (de Botton, 2007; Hildebrand, 1999). Thus, it might be hypothesized that the pareidolia effect for the Robie House will entail a higher proportion of positive emotions (happy, relaxed etc.) than for the Villa Savoye.

The software used for this research has been trained for pattern recognition using two international databases of facial expressions and calibrated using examples of both real faces as well as ‘cartoon’ and ‘abstract’ facial representations. Thus, the software indicates the probability of a face being
identified in a façade and then the emotional content of its expression is classified. The software, including its training and validation process, has been the subject of several previous papers by the authors (Chalup, Hong & Ostwald, 2008; Chalup, Hong & Ostwald, 2010; Chalup & Ostwald, 2010; Hong 2013; Hong, Chalup & King, 2012; Hong, Chalup, King, & Ostwald, 2013) and so only a brief description of it is included here. Instead, the focus of the present paper is the use of this software to demonstrate how the presence and emotional content of pareidolia in architecture might be studied.

While this limited application of the software to architecture is unlikely to uncover a clear or definitive result, the paper records an early step towards an alternative, neuroscientifically informed way of considering human reactions to the built environment. The interpretation of the paper’s findings is also necessarily limited by one important factor. The sensitivity threshold at which the human mind will identify a facial pareidolia has not yet been determined by neuroscience. Thus, the software used for the present paper has not been trained to mimic human sensitivity to detecting pareidolia, rather it uses a statistical or probabilistic approach to determining which facial pareidolia are strong enough to be sensed. Future research will seek to calibrate the pattern recognition function of the software more closely to the average person’s capacity to detect a facial pareidolia.

Background

Past research into the human emotional response to architecture has typically been framed around either phenomenological or psychological explanations. In the former case, it has been posited that certain buildings fail to stimulate the full range of human senses and thereby leave the mind unsatisfied with its experience (Norberg-Schulz, 1980; Pallasmaa, 2005). In the latter case, the explanation is that some buildings do not provide the type of formal and spatial experience that the human psyche requires for safety and security (Hildebrand, 1999). For example, Modern architecture, as exemplified in the Villa Savoye, has been repeatedly criticized for focusing attention almost exclusively on the visual and surface qualities of a building while ignoring the aural, tactile and depth-related ones (Pallasmaa, 2005). It has thus been disparaged for evoking subconscious unhappy or concerned responses from viewers because it lacks the scale, materiality and properties of enclosure and outlook that are allegedly so important to emotional wellbeing (Hildebrand, 1999). Yet, what if there was another explanation for the way people react to architecture? What if the mind subconsciously interprets some specific façade forms as expressing particular emotions and we, in turn, automatically respond to these expressions?

Vidler (1992) famously suggested that some buildings possess ruptured or incomplete façades which the human mind reads as a type of partial face, thereby evoking uncanny or unheimliche emotional responses. Indeed, there is a long history in architecture of examining the physiognomy of a façade to determine its noble or savage expression (Dodds & Tavernor, 2002; Ostwald, 2000; Ots, 2010; Porter, 2004). This tradition is closely associated with a type of bio-mimicry, wherein the form, scale or texture of a building façade evokes the presence of the human body (Burroughs, 2009; Feuerstein, 2002; Ostwald and Moore 1998). But Vidler’s (1992) argument is more specific, it uses Freudian psychoanalytical theory to suggest that the hidden or incomplete face evoked by a façade’s geometry may trigger a negative emotional response in people. While the majority of this past research into the imagined physiognomy of a façade has been philosophical, semiotic or symbolic in nature, there is a growing body of neuroscience research which suggests that there may be some truth to this proposition.

In the last decade, research in cognitive science has demonstrated that large areas of the human brain are concerned with recognizing faces and then interpreting the emotional content of facial expressions (Engell & Haxby 2007; Vuilleumier 2007; Vuilleumier, Armony, Driver & Dolan, 2003). Recent results also propose that the processing of facial information is a special task that, in contrast to information about other objects, can be handled sub-cortically, non-consciously and independently of visual attention (Johnson, 2005; Finkbeiner & Palermo, 2009). This suggests that the human cognitive visual system is optimized for associating abstract, face-like patterns with the emotions of corresponding human facial expressions (Hasson, Hendler, Ben-Bashat & Malach, 2001; Le Grand, Mondloch, Maurer & Brent, 2001). This phenomenon is responsible for the perception of facial pareidolia in both natural and artificial forms (Fig. 1).

While there are many alternative, and potentially valid reasons that might explain why some architectural façades trigger emotional responses in observers, the presence of facial pareidolia (either ‘strong’ or ‘weak’) is one possible explanation that has never been adequately examined.

Figure 1: Example of strong facial pareidolia in a cloud (left) and in a building façade (right).

Software

The software used in this paper to identify the presence and suggested emotional state of facial pareidolia, relies on two interconnected systems; face detection and expression classification. The detection system uses a type of machine learning called a one-class Support Vector Machine (SVM), while the expression classification system uses a specially
modified multiclass SVM (Hong, Chalup & King, 2012). Both of these systems were trained using a set of 280 images of human faces that were taken from the research image data sets of Japanese and Caucasian Facial Expressions of Emotion (JACFEE) and Japanese and Caucasian Neutral Faces (JACNeuF) (Ekman & Matsumoto, 1993). All of the images from these data-bases were cropped and resized prior to training so that each showed a full individual frontal face in such a way that the inner eye corners of all faces appeared in exactly the same position (Figure 2). Profiles and rotated views of faces were not taken into account.

Figure 2: Image prior to face detection and expression classification (Left); Image after face detection and expression classification (Right).

Each image being analyzed is processed through one of three different filters: binary, greyscale and Sobel equalization. The three filters are used because the results of each approach to image pre-processing can be compared for statistical validity. The software is then set to scan across the filtered image, at multiple scales, examining every configuration of geometry or form in an image to see if it conforms to the facial patterns in the training data. The software is capable of identifying multiple faces in an image with a high degree of accuracy, although as images become more abstract (‘weak pareidolia’) the faces being detected have a lower mathematical level of confidence. Once a face is detected, a box is drawn around its extent.

After the complete set of faces in the image has been detected, then Ekman’s, Friesen’s and Hager’s (2002) facial expression classification system (FACS) is used to code the facial pareidolia. While acknowledging that there is ongoing debate about the fundamental nature and understanding of emotions (Barrett, 2006; Panksepp, 1998) the use of eight classes of facial expression allows the results of this paper to be compared with that of previous research. The eight emotional states recognised in FACS are anger, contempt, disgust, fear, happiness, neutral, sadness and surprise. The software classifies each face detected in the image into one of these expressions and colour codes the identifying box according to the following scheme: angry = red; contemptuous = orange; disgusted = green; fearful = black; happy = white/yellow; neutral = grey; sad = blue; and surprised = violet. As a graphic representation of the proportion of expressions in a complete image the software then produces a color bar across the base of the figure (Figure 3).

Thus, this method analyses all possible facial pareidolia present in an image, at any scale or viewing distance. This approach has been taken because the problem of identifying illusory features has no single, optimal solution, but rather it is dependent on the scale at which the image is viewed and the sensitivity of the viewer to the presence of pareidolia. Moreover, in the case of architecture, the angle at which the building is seen and even the time of day or season are all critical to the identification of facial pareidolia. Thus, an objective and repeatable method for the examination of pareidolia in architecture is necessarily based on statistical probability derived from a large set of data. The end result of this process is not a single answer, but rather a complex profile for each elevation that encapsulates the complete range and type of different expressions and how this changes under different natural lighting conditions.

**Application**

Using CAD models of the Robie House and the Villa Savoye, five versions of the south elevation were produced for each. The versions, all of which were orthographic views, were: (1) flat shaded, and versions generated with shadows cast at the following times, (2) Winter solstice (December 22) 10.30am and (3) 3.30pm, (4) Summer solstice (June 20) mid morning 10.30am and (5) 3.30pm. The flat-shaded variation provides an initial benchmark and the four time-based images were used for the results reported in this section.

For the face detection process, several image formats were evaluated across a number of resolutions where the images used for training the classification models are resized to $n \times n$ pixels. After testing, the most favorable outcome for visual confirmation was identified as the binary edge image using the Canny edge operator. Once the models were trained for detection and expression classification, a search was performed on the façade image looking for possible faces. A detection window of $n \times n$ pixels was then scanned across the image at multiple scales and locations. The size of the detection window corresponds to the resolution of the training images. During this process a number of images scales were gathered together with the original image being resized until it is no smaller than the size of the detection window. The scale factor used for resizing down was 0.8, or 1.25 for up scaling.

After this, two distinct conceptual paths that could be followed—a top-down search where the image is examined as a whole before considering its parts, or a bottom-up search where the parts of the image are examined before the scale is gradually increased. Both approaches produced similar results. At each scale the detection window of $n \times n$ pixels was moved from top left to bottom right and, rather than examining every pixel location, a step size was defined of roughly 10% of the width or height of the current image scale, whichever was smaller.
**Results**

For the complete study of ten images, using three detection systems and three classifiers, over one hundred sets of results were produced. However, for the present paper, only one set of results is reported. These are the outcome of the binary detection system using binary expression classification. The detection and expression classifier were trained on binary edges using a histogram equalized greyscale approach.

For the *Robie House*, on average 54.25 facial pareidolia were detected in the façade, with a low of 38 pareidolia detected on a winter morning (low sun illuminating the walls more evenly, evidently reduces the presence of shadow-affected pareidolia) whereas on a summer afternoon, with many elements in the house casting strong shadows, 75 pareidolia were detected. On average, the facial expression with the highest presence was anger (24.44%) followed by disgust (19.80%) and contempt (18.99%). Complicating these results is the fact that the high average result for anger is dominated by one particular time, June afternoon, when the shadows are more pronounced, whereas on a December morning, the highest response is surprise (23.65%) and a relatively high proportion of happy emotional expressions (21.05%) (Table 1; Figs. 3 - 4).

For the *Villa Savoye*, during the month of December, with shallower sun angles, 57 facial pareidolia were detected in the morning and 57 in the afternoon. In Summer, with higher sun angles casting deeper shadows, 64 were detected in the morning and 59 in the afternoon. When the expressions of these pareidolia are calculated as a proportion of the whole, and then averaged across the complete set, the single expression with the strongest result is anger (30.92%) followed by disgust (23.94%) and surprise (19.5%). During the morning (both December and July) the proportion of disgust expressions is lower (approx. 7% less) while the proportion of angry expressions is higher (approx. 6% more) (Table 2; Figs. 5 - 6).

**Conclusion**

This paper has demonstrated that it is possible, with the assistance of pattern recognition and machine learning techniques, to use software for face detection and expression classification for images which have only a ‘weak’ correlation with the standard human face. By definition, the pareidolia effect is largely concerned with situations where the correlation is weak and thus this approach to analysis is
ideal for architectural images that are not expected to possess a single face with a fixed emotion.

The results of the tests of the Villa Savoye and the Robie House do also clearly demonstrate that pareidolia presence is sensitive to season and lighting conditions; because shadows change the way the building appears and evoke different numbers of potential pareidolia and signal different emotions. The complete set of expressions identified in this way is more complex to interpret, being dominated (like the classification system they are derived from) by what might be considered negative emotions. Indeed, even the test image (Figure 3) has been identified as being dominated by angry emotions, although in isolation, none of the faces are expressing this reaction.

Finally, if we return to the initial hypothesis – that the Villa Savoye would express a higher proportion of negative emotions than the Robie House – the results are inconclusive. The two houses ultimately have the same average proportion of happy and surprised expressions (rounded to 30% for each) although the Villa Savoye has a higher proportion of anger and disgust (55% verses 45%). The primary difference between the two is seasonal, with the Robie House evoking more pareidolia and being notably more negative only at certain times of the year, whereas the Villa Savoye has less seasonal variation.

Figure 5: Villa Savoye, south elevation, pareidolia detection and classification. December AM (upper), December PM (middle) and June PM (lower).

Figure 6: Villa Savoye, mean results.

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Aesthetic Qualities of Urban Spaces

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Abstract

This paper outlines a research project in planning that will attempt to address issues of the aesthetic experience of urban space from the user’s perspective through a number of empirical studies intended to result in a set of principles applicable to regaining spatiality and human scale in the practice of urban design. The initial question is which role the perception of selected spatial qualities, which make an urban space a perceptual gestalt in its own right, play in the formation of aesthetic judgements of such spaces. Starting with a collection of urban spaces that are commonly considered aesthetically successful in the history of architectural theory we intend to find commonalities in spatial organization and Gestalt characteristics, investigate their formal qualities, correlate a selection of these with aesthetic judgements in various empirical studies, and finally investigate which role size-dimensions play in the judgement of these spaces.

Keywords: Spatial Perception, Aesthetic Judgement, Scale, Urban Design.

Problem

Since the end of WWII, concepts of designing urban space have undergone a radical shift in terms of form and scale. The traditional concept of a bounded urban space with a planned discernible perceptual gestalt formed by the enclosure between facades of buildings, foliage or architectural elements, has been replaced by the dictum of the „urban landscape“ where solitary buildings are surrounded by residual spaces that do not form perceivable spatial figures in their own right. This shift was furthermore accompanied by an equally dramatic change in urban scale, i.e., how size, buildings and spaces appear in relation to the people experiencing these spaces.

From Le Corbusier’s La Ville Radieuse and Hilberseimer’s Urban Blocks to the development of the vast spaces of Brasilia and the infamous Projects of Pruitt Igoe: all can be traced back to an ideology whose goal was to replace the traditional urban space of street and city square with an open space urban landscape. Building ordinances that regulated the appearances of public spaces became increasingly seen as a means of curtailing the individual architects creativity as well as the developers right to maximize return through build-out. Consequently, this development resulted, as Roger Trancik (1986) characterized it, as an era of lost space. Many authors - sociologists, urban planners and psychologists - have criticized the ever increasing alienation of humans from their own urban spatial habitat. Examples are Jane Jacobs’ book Death and Life of Great American Cities (1961) or Alexander Mitscherlich’s Die Unwirtlichkeit unserer Städte. Anstiftung zum Unfrieden. (1969) who expressed a strong discomfort with the resulting loss of public space and with the appearance of heterogeneous, faceless, suburban developments and inner city renewal projects by means of “tabula rasa” rebuilding.

An increasing dilemma between the reality of postwar urban design on the one hand and the desire of planners and theorists to develop strategies to overcome this disconnectedness on the other, became evident in academic research beginning in the 1970s. Kevin Lynch’s seminal text The Image of the City (1981) was a catalyst for many writings in the field of urban design, e.g., Appleyard (1981) who concentrated on the quality of urban spaces and Bruns & Schmidt (1997) whose research focuses on quality growth in urban design. Other examples, which have become sources of inspiration for planners and architects, are Cullen (1961), Jacobs (1993) and Weber (1995) showing dimensions and spatial characteristics of great public spaces all over the world.

In the last quarter of the 20th century, many attempts have been made to bring back bounded urban space to contemporary city design: during the period of Postmodernism in architecture, the movement of New Urbanism, as well as economic pressure for greater urban density to accommodate greater amounts of residents. Some cites changed their building codes back to the traditional forms of the city block, the square and the street, replacing the loosely placed solitaire. And yet, by and large, the resulting urban spaces did not reach the spatial qualities of their original role models due to the lack of human scale that characterized urban spaces from the medieval periods until the 19th century, these combined a bounded clear gestalt with a human scale due to the dimensions of the spaces and the bounding facades. Moreover, in recent years, it has become evident that it is not only the functional and infrastructural qualities which determine the attractiveness of a city, but that its visual identity plays a crucial role in fostering its citizens’ identification with a place (Lynch, 1960; Appleyard, 1981; Carp, Zawadsky & Shokrin, 1976).

While there is a clear trend towards returning to a more dense urban fabric in most of Central Europe, however, city design has remained a somewhat erratic planning process because of the pressures of the demands of economics and traffic infrastructure on the one side and because of the lack of knowledge about the experience of urban space through inhabitants on the other. For planning departments it has
become increasingly important to explore questions such as: which spatial parameters influence a person’s judgment about the perceived visual quality of urban spaces? Are there aspects beyond economic and semantic aspects of the use of space? Which are the spatial properties that are responsible for the judgment of beauty? Are there parameters that are largely independent of personality influences or individual differences? For an introduction and overview of the field of aesthetic perception of the built environment see Kaplan & Kaplan (1978), Altman & Zube (1989), Nasar (1988, 1992), Stamps (2000) and Gifford (1997)

**Project Proposal**

Our planned research project will attempt to address issues of the experience of urban space from the user’s perspective through a number of studies that are intended to eventually result in a set of principles applicable to regaining spatiality and human scale in the practice of urban design. This study, at a general level, is aimed at furthering the development of a theoretical understanding of the influence of selected spatial properties and judgments of the visual qualities of urban spaces. Findings would be important for developing design recommendations for specific urban situations, aim to help planners understand some of the ingredients of making places more beautiful, will be important for teaching because they will help raise consciousness for the vocabularies of spatial design, and in the end will help to answer the question: How do we improve the quality of public spaces?

The initial question is which role the perception of selected spatial gestalt qualities play in the formation of aesthetic judgements of urban spaces. Little empirical research has been conducted in this field hitherto. Weber, Schnier and Jacobsen (2008) have addressed the question of formal properties of streetscapes and Wolter (2006) has investigated the role of contour and closure in the perception of urban squares. Brucks (2012) has focussed on the role of perceived density of streets in dependence of format and closure. Studies on the aesthetic judgment of urban spaces have usually not addressed the issue of the size of the spaces in consideration. An urban square or a boulevard that ranks high on a scale of aesthetics judgment, might not necessarily have the same rank if its dimensions are reduced or enlarged in a replica or similar spatial setup.

Finally, it is important to note that addressing the experience of urban space from the user’s perspective entails two major aspects, namely that the study look at the actual conditions of visual perception in the everyday use of the city and at the difference in judgement non-experts and experts.

**Pretest**

**Urban Space Typology**

In order to arrive at largely generalizable principles of design, the selection of spaces for analysis is a crucial first step. In the fields of architectural history and theory there is little argument about the aesthetic qualities of many historic urban squares, streets and boulevards, especially if these are considered within the context of classical urban design manuals like the works of Sitte (1889) or Stübben (1890), who explicitly aimed to study qualities of “beautiful” spaces. (However, while there seems to be a fair degree of agreement amongst the experts in the fields of architecture and planning in the literature, this is not to say that this viewpoint would be shared by non-experts as well, and will be a question also explored in this project)

We intend to begin our study by categorizing urban spaces in the history of (Western!) architecture by type, e.g., various shapes of urban streets, squares and the like and select those that are considered more and less aesthetically successful spaces with the support of a small expert panel. As for a first identification of formal characteristics of these spaces in the various categories, pictures and plans of these spaces can be ranked and grouped by an expert panel and primary determinants of aesthetic judgment will be derived using principal component analysis and based on the independent expert’s judgments. This initial test can be used to generate hypotheses about the dimensions/qualities responsible for judgmental variance.

In addition, the following steps are considered: Sorting of the selected spaces according to similarities (Q-sort); Ranking according to preselected criteria of preference; ranking according to aesthetic criteria; interviews, in which test persons explain their preferences. All of these tests will be performed with non-experts and experts (architects, urban planners, architectural historians)

**Gestalt Qualities of Urban Spaces**

As for the Gestalt qualities that make for aesthetically high ranking urban spaces, there is already a substantial body of research from a perspective of visual-spatial perception. Based on the Gestalt psychologists and the concept of ecological psychology, Weber (1995) described properties of figuredness in urban and architectural spaces. Stamps (1999) performed a number of empirical studies on the role of spatial boundaries of streets in regard to aesthetic judgements. Brucks (2012) looked at streets from the perspective of the user experience, and Jacobs (1993), Bosselmann (2008) and Appleyard (1981) from a practitioner’s perspective. From these various sources, primarily based on Weber’s book, qualities of successful urban space can be defined and be compared with the determinants of aesthetic judgment that were derived using principal component analysis in the first part of the pretest. One of the principles working hypothesis derived from the studies mentioned above, is that the stronger the degree of figuredness, the higher the ranking in the resulting aesthetic judgements will be. The selected Gestalt qualities will form the basis for the main test.

**Main Test**

**Correlation of Gestalt Qualities and Aesthetic Judgements**

The main test will examine the influence of selected Gestalt qualities on aesthetic judgements by using computer-generated visual simulations of urban spaces. The position of
the viewer will be within the visual model of the space. It is planned to study differences in judgment between stills and panoramas where the viewer is able to move positions with a computer mouse. However, Stamps (1990) has demonstrated, that there are basically no differences in the judgements of real 3D situations and their 2D representations.

Independent variables are the qualities that were defined in the pretest, dependent variables are, for example, experienced density or closure that can be marked on a rating scale, or aesthetic judgments such as beautiful, etc. Again, like in the pretest, non-experts and experts will be compared as well.

Scale: the role of sizes of urban spaces in aesthetic judgements

Studies on the aesthetic judgment of urban spaces have usually addressed formal parameters of the shapes of urban spaces or the bounding facades, but not the sizes and proportions of the spaces themselves. A space with one and the same form and proportion might be judged differently depending on the distance between the space-bound facades and the scale of the architectural elements. Whether or not the issue of scale might have an impact on the resulting judgement will be explored in the final part of the study. Examples of replicas of famous urban spaces in smaller scale can be found in Disneyland or Las Vegas, while fascist architecture in Germany or Italy often show the dimensions of such places enlarged several times.

On the issue of human scale, little research is known apart from Hermann Maertens (1887) still seminal text on the concept of scale in the arts and architecture. Little has been added to his findings hitherto, except from Voßkötter’s (2010) doctoral thesis supplying definitions of the term supported by her own empirical studies on the comparison of actual and experienced sizes of buildings. In our own study we intend to look at the role of how the dimensions of spaces and bounding architectural elements alter the judgement of one and the same space but with a different scale. In a first step, the computer-generated visualizations will be altered by changing the distance between the space bounding facades of buildings. In a second step, the height-width proportion of the spaces will be preserved while the distances are increased and thus the number of stories of the bounding facades will be increased as well.

Outlook

The results of the various main tests will be compared with the principal claims of major theoretical approaches in architecture and urban design in order to see whether historical and contemporary normative theories of form and space in urban design indeed produce the desired results that conform with aesthetic judgments of ordinary users. After all, planners are planning urban spaces for the. But it is interesting to explore, whether the judgments of experts differs, and if so, why that might be the case and why planners often insist that they know better than users what a successful urban space ought to be like. The results of our study would be important for further developing urban design toolkits and to aid planners in understanding some of the ingredients of making places more beautiful.

References


PART TWO: SPOKEN PAPERS
Grasping This Nettle
Possible Effects of Eielson’s Zen-Taoist Nudos on the Audience

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Abstract

Jorge Eduardo Eielson (1924-2006) has Taoism, Zen Buddhism and the quipu (knot) as his major influences. His series of knots comprehend poems, paintings, installations, assemblages, and performances. Zen and Taoist influences have an effect on his quipus series, and on the audience and readers’ experiences, because they bring into being an intersubjective experience—a momentary union of the work of art, audience and author—whose consequences might be evident outside the artistic phenomena. Eielson’s work defies what we understand as art. This challenging characteristic joined to the consequences for the audience are appealing to my research. After explaining how Zen, Tao, and the quipu allow audience and author the achievement of an intersubjective experience, I will an applied-research proposal.

Keywords: knot; quipu; language-like mediator; Jorge Eduardo Eielson; Taoism; Buddhism; authorship; audience engagement; readership; intersubjective experience; state of flow; experiment; empirical aesthetics applied to literature and arts.

Grasping This Nettle

During the second half of the 20th Century—even before should Thoreau and Emerson are taken into account—, a fair number of authors were influenced by the (re)discovery of Eastern cultures and religions—particularly Zen Buddhism and Taoism. The Beatniks, and John Cage, as well as Gary Snyder in the United States; Paulo Leminski and Augusto de Campos in Brazil; José Watanabe and Jorge Eduardo Eielson in Perú constitute some representatives of the trend.

In this paper I will focus on Eielson because it interests me that he as part of a peripheral culture opted for other peripheral cultures as major influences on his work. Eielson also combines Taoist and Zen influences with the Pre-Columbian quipu—a.k.a. knot—without the usual indigenista approach. The result of this mixture has as an ideal consequence a change in the way audience and readers experience his work, because the same blending of influences allows the work of art to becoming a mediator between author and audience. The latter acquires a relevant role intended to project the aesthetics experience beyond the gallery and the (chap)book.

One: The Nettle

Nudos
Que no son nudos
Y nudos que sólo son Nudos (Eielson, 2003).

Eielson’s artistic practice includes multiple media: printed texts, installations, performances, assemblages, paintings and so on. The quoted text can be a poem and a poetics statement. Back in 1972, during the XXXVI Biennale di Venezia, Eielson showed some of his work—mostly paintings—, which he called quipus and tensiones (knots and tightness/tensions) an allusion to the pre Columbian knotted system. The exhibition had as an introductory text excerpts from his novel El cuerpo de Giulia-no (published in 1973). I will quote it partially:

En el lenguaje oral [de los antiguos peruanos...], tergiversar, alterar, no eran sino crear, transfigurar, descubrir. Lenguaje y lengua puras, generadores del mito. De fabulosos teoremas verbales que la experiencia cuotidiana [sic] no es capaz de contener sino en fragmentos. Miserables migajas del festín celeste. Luego si algo había de quedar, si alguna utilidad tenía el cielo en la tierra, los escritos del templo, los kipucamayos inmovilizaban en uno o varios gestos manuales la entidad del argumento. Nacían así sistemas de cuerdas y nudos de colores, originalmente utilitarios. [...] Sólo más tarde apareció el poema, entre los dedos del escriba y los del sacerdote del Sol. (Eielson, 2004)

The text closes with a list of quipus and their meanings, attributed according to the number of knots and the colours of the fabric. For instance one violet knot refers to the moon. I have to stressed that these meanings are a fictionalised version of the quipus actual meanings; although Denise Arnold and Juan de Dios Yapita have proved that the quipu was an accounting system but also gave “rise to a multitude of other practices (dancing, painting images, oratory, making libations, praying, singing, playing, music) and regional textual forms (cloth and braid, glyph and song) that stem from common weaving elements”. (Arnold & Yapita 2006). Certainly the knot had a symbolic/spiritual meaning for kipucamayos and apparently for Eielson too. However the idealisation in Eielson’s words is at least controversial and needs to be pointed out—and somehow disregard for the sake of the research. Yet Eielson used the knot as a mediator between the author and the public. The quipu achieved the configuration of being both an expression of Buddhist and Taoist influences, and also homage to Andean cultures.

In the poem read at the beginning of the paper, there are “nudos que no son [...] y nudos que sólo son” (“knots which are not [...] and knots which only are”) the contradiction breaks the conceptual unity that words usually have in poems and creates an emptying of the meaning which adds a subversive touch to Eielson’s practice. The tension between
the written object and the subversion of the meaning rings a non-Western bell. It was already hidden in the equivalence of “hand-made gestures” with “writing” (see excerpt from El cuerpo de Giulia-no) Eielson actually takes into account some lessons from the Tao te king and applies them to his installations, paintings, performances, the series Paisaje infinito de la costa del Perú, Amazonia, Quipus and even his writing. Tao’s lessons XIII and LXIV allow me to explain further. The first lesson names an agent as the one who is entrusted to care for all things by surrendering. The second assumes the condition of not-acting (manipulating) as a way of not-losing.

What do you mean by accept misfortune as the human condition?

Misfortune comes from having a body.

Without a body, how could there be misfortune?

Surrender yourself humbly; then you can be entrusted to care for all things.

Love the world as your own self; then you can truly care for all things.¹³ (XIII)

He who acts defeats his own purpose;
He who grasps loses.
The sage does not act, and so is not defeated.
He does not grasp and therefore does not lose.

The sage seeks freedom from desire.
He learns not to hold on to ideas.
He brings men back to what they have lost.
He helps the ten thousand things find their own nature.

But refrains from action.¹⁴ (LXIV)

(both Lao Tzu 1996)

In a flash recap: what on Earth is the relationship between Tao, the entrustment, the sage and Eielson’s quipu? First of all, the entrusted has as conditions of existence a humbly surrendering and loving of all things—contrary to the colonial entrustments. In the context of the novel El cuerpo de Giulia-no the answer implies the acceptance of death, poverty and the acceptance of the knotted nature of the narrativity and narration of the fiction itself. In the context of Eielson, the artist, the answer involves a leap of faith that distances him from the normal practice of authorship—so as to give way to the shaman-like figure. Sage can be translated as saint and as shaman. And Eielson himself has said he wants to go back to a time when human creativity was represented by shamanic practices. Not (only) because of his fondness of mysticism, rather because his idea of time was cyclical. So beforetime and nowadays “no hay lugar para ningún sujeto fijo”, hence there seems to be no room for a frozen genius artist forged in individuality. Also his idea of the shaman is oriented towards an “expresión global de la creatividad humana” which pursues other approaches towards materiality of the work of art (Eielson, 1995).

Now lesson LXIV and its advice, which states: not to act and not to grasp, not to hold onto ideas, starts to make sense. From that moment on, Eielson’s practice becomes a practice not a development of concepts or conceptualisations. Therefore the emphasis goes on the object (work of art) rather than the author and his ideas. Once the author is absorbed by the practice, the latter becomes a multitude of media: fabric installations, wooden assemblages, paintings, portraits, written poems, novels, photographs, or performance. Whatever the action of the author is, it must not act (manipulate), distort or grasp within the constraints of conceptualisations or extensive rhetorical figures the media and materiality of his work. If this task were successfully achieved (along with a farewell to the idea of the genius), readers/audience would have the opportunity to observe the Tao (the way or the universe)—which can be considered the Sacred at the reach of our hands.

¹³Not to be read but notice: Spanish translation is useful due to the use of “encienda”, “digno” and “honrar” Qué significa honrar la humildad como algo inquietante?Honrado lo humilde, inquietarse si obtenido, inquietarse si perdido./Eso significa honrar la humildad como algo inquietante./¿Qué significa apreciar el infortunio como a la propia persona?/Si tengo infortunio, es por tener persona./Si no tuviera persona, ¿qué infortunio tendría?/Por eso, quien honra cuanto hay bajo el cielo como a su propia persona es digno de que se le confíe cuanto hay bajo el cielo./Quien ama cuanto hay bajo el cielo como a su propia persona es digno de que se le encomiende cuanto hay bajo el cielo. (Lao Zi, 2004)

¹⁴Notice the use of “manipula”, “pierde” and “retiene”: [...] Quien manipula arruina, quien retiene pierde./Por eso el santo no manipula./y así no arruina./no retiene y así no pierde. (Lao Zi, 2004)
before). As Hugh Kenner said about the vortex, the most relevant trace is not the materiality or the material support “but the visible pattern of energy” (Kenner, 1972) on it. The knot matters less as an object, than as process whose practice jumps from one medium to another. The material support/materiality embodies the knot, rather than having the knot acted upon it.

![Figure 2: Installation Nodo Lunare.](image)

![Figure 3: Wooden assemblages Nodo.](image)

![Figure 4: Cloth and canvas Disco Terrestre.](image)

In this sense the Tao and the quipu try to demystify the work of art as an object of veneration. There is rather a chance of wanting the audience to becoming closer to the artistic practices—like all processual art does. In this case, with the mediation kept to its minimal. In a way the artist or performer becomes an agent of something that seems sacred or superior but quotidian at the same time. However Eielson seeks not for the main role, he is neither a vicar nor a privileged actor because as a Buddhist student (as he considers himself) the main figures are accepted as long as they are agents or incarnations of the universe. This is how the knot becomes an ungraspable consequence in his practice, and the author becomes an agent who makes the knot possible but forces nothing.

**Two: The Grasp**

The quipu turns out to be a gift for the audience and readers, and aims to absorb (but not contain) the practice and the agent-author. Ideally the knot could also absorb momentarily its public and its momentum—giving way to an intersubjective experience. The latter is understood as the partial suspension of the boundaries between the author, the object and the audience (for further references, see Habermas\(^{15}\)). The suspension would allow the flowing of subjectivities (or subjectivity as Place and Fitterman name it) and permit audience and agents to experience (perhaps) a state of flow, which is “a state of intense absorption and involvement with the present moment […] when you’re a totally immersed in what you’re doing, fully concentrating and unaware of yourself” (Lyubomirsky, 2006). For a moment audience, object, agents would become a nebula or cloud in which those involved might be momentarily absorb—as it happens in the performance and novel *El cuerpo de Giulia-no*.

If the intersubjective experience and the state of flow are actual phenomena rather than ideas, they must have consequences outside the literary and artistic spheres—in terms perchance of increasing the capacity to deal with challenging situations. If the above is proven, another positive consequence will be the union of art and science in their need to experiment.

As much as I wanted to guide an experiment with Eielson’s *Quipus*, the death of the author in 2006 might leave the experiment incomplete. I focus now broadly on experimentalisms or subversive or renewed literature and art given that that kind of art demands more attention and participation from the audience and readership. And that has to have a consequence in the people who accept the challenge and become participant of/within a work of art. The importance of such hypothetical discovery guides me to present a possible experiment.

**Three: The Effects**

Picture for a moment a venue where artists and audience could co-exist with observers without being inhibited. Observers would be filming and interviewing before and after the artistic event. The main aim would be to finding out whether the intersubjective experience and the state of flow actually happen.

Subjects would be asked about their experience, the feelings during the artistic event, their ability or inability to lose track of time, of self awareness, of involvement, and their general enjoyment of the event. I have done a quick survey amongst students who were in the Jumex Museum for a specific exhibition, *Habitar el tiempo* (2014)—albeit I was not able to monitor them at all times, the ones who were not disgusted by contemporary art were able to have something that resembles an intersubjective experience.

Ideally a second stage of the research would aim to trace neuronal paths of actual audience and readers when they

\(^{15}\)Intersubjectivity as I understood it is closest to Jürgen Habermas’ idea of unbound subjectivity, which is the only entity capable of aesthetics “experiences […] that are only possible to the extent that the categories of the patterned expectations of organised daily experience collapse” (Habermas, 2002)

\(^{16}\)Taken from the findings of Csikzentmihalyi’s and Lyubormirsky’s on creativity and happiness.
experience an artistic event. Among the questions that I would like to respond are: do we create a special neuronal path when we are in front an experimental piece?, do we increase the production of any chemical?, do we experience high levels of stress?, what is the impact in our brain?, does the possible brain-impact of experimental literature and art have a consequence in our daily lives (in terms of abilities, capacities, emotions, feelings)? If there is an impact, how long does it last?

The experiment will require to continuing with interviews and brain scans of the targeted audience and readers two weeks, one month, three months and six months after the artistic event. The following-up might prove whether the change in the neuronal paths and improvement in the subjects’ abilities—due to the intersubjective experience—would have been consolidated or not.

Having said that, I must admit that this possible experiment needs further thought—which is why I am here today to respond all the doubts I can, and take note of all the possible improvements of this idea. Without adding anything more, I thank you for your patience and let the empirical aesthetics criticism begin.

References

Some Aesthetics Results of a Personological Inquiry into the Italy’s Mezzogiorno

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Abstract
The research it consists in a survey conducted by the means of social psychology, which examines the tendency to authoritarianism in the human personality. Subjects were submitted a questionnaire, composed of three scales concerning ethnocentrism political and economic, conservatism and fascism. Hence the distinction between high-scoring subjects and low-scoring subjects less keen on authoritarianism. An interview and a series of projective questions constitute the “qualitative” part of the study, who is an attempt to verify the themes emerged from the quantitative study. The subjects were submitted to the vision of a single image, consisting in one of my products. A grouping of the views expressed allows us to classify subjects who tend to perceive the image as disturbing , not accepting it (subjects with a high score) subjects who perceive it as pleasant (subject with a low score). Subjects who perceive exclusively to the ideological aspect of the image (subjects who often belong to the extreme peaks).

Keywords: Fascism; Visual perception

Introduction
This search moves from the study of “Authoritarian personality” collecting the results of an interdisciplinary research on psychology of anti-Semitism, carried out between 1944 and 1949 by Berkeley University and sponsored by the German philosopher and sociologist Theodor Adorno (1903-1969) together with his collaborators Elsa Frenkel Brunswick (1908-1958), Daniel Levinson (1920-1994) and Nevitt Sanford (1909-1996).

This study adopts the means of social psychology to investigate the phenomenon of injury and in particular authoritarianism, which is a more complex syndrome that permeates the structure of individual personality. In fact, with the authoritarian personality, you designate a personological model that is the focus of this discussion and that allows us to clarify the importance of psychological and personal factors such as to determine attitudes and behavior either generally authoritarian and, more specifically, conducive to the emergence of anti-democratic phenomena of mass.

I order to identify a possible predisposition of people to Fascism, it was only right to take into account the specific social, political cultural climate examined.

The research is carried out in a little town of jr. high graduation Italy, moving by the hypothesis that ideology is an expression of tendencies present in personality, and considering that is possible to find in this topic some of the most acrimonious contradictions of modern democracy: putting emphasis on the question of personality to better investigate Fascism on a psychological level, is due to the fact that Fascism needs a mass base, that ensures the active participation and submission of terrified people, relying on the irrational and emotional needs.

Moreover the research aim to identify the degree of subordination of subjects to injury, investigating the possible connection between Fascism and visual perception, to understand how the vision of an image affects ideological conditioning.

Method
Survey
It was necessary to identify people with a potential Fascist behavior, before trying to study them. The quantitative part of the study consists of a survey made by an opinion scale of 42 propositions, taken from “Authoritarian personality”. Opinion scales aim to take ideological tendencies as ethnocentrism or political-economic conservativism, then Fascism scale is introduced to measure anti democratic tendencies in personalities. You can answer to each proposition with a different like value: agree (strong, moderate, weak) disagree (strong, moderate, weak) and indifference. Answers are related to score: (disagree: -3 = 1 point; opposition: -2 = 2 points; weak opposition: -1 = 3 points; indifference: 0 = 4 points; weak agreement +1 = 5 points; moderate agreement: +2 = 6 points; strong agreement +3 = 7 points). In the three scales all propositions were considered as ethnocentric, conservatism and in general Fascism advantaging. Propositions are 42 in total, so scores can change from 42 to 294. Medium score for each proposition is obtained dividing total score by 42, however the propositional division of scale let us define a clear situation for each proposition. Subtracting the minimum to 294, we obtain the total measurement range: 252. We will divide this value by 4 to obtain a division of the subjects by the evaluation of survey’s results: strongly democratic (from 42 to105), moderately democratic (from 106 to 168), moderate fascist potential (from 169 a 231), strong fascist potential (from 232 to 294).

Scale E
1. The numerous political parties tend to confuse national problems, to increase the election expenses and to arouse unnecessary unrest. For these and other reasons, it would be better to abolish all political parties except the two main.
2. Numerous deficiencies and the general inability of integration of immigrants that have invaded Italy, show that we should send them back to their country of origin as soon as conditions permit.
3. Patriotism and loyalty are the first and most important requirements of a good citizen.
4. Nations There will always be superior and inferior nations in the world, and, in the interest of all nations that it is better to have higher control of world affairs.
5. Refugees of Eastern Europe are probably in a situation of need, but it is a serious mistake to allow them to invade the country.
6. Most of our social problems would be solved if people immorral, corrupt and defective could somehow be removed from the scene.
7. Whether working women should occupy positions typically female, and then the nurses, secretaries or take care of children.
8. Italy will not be perfect, but the European way of life has brought us as close as possible to human beings in a perfect society.
9. Only natural and right that everyone thinks that his family is better than any other.
10. If they continue to grow economically so fast, the Chinese will eventually take over the world in a few decades.
11. The latest national news events prove that there is something deeply animal to distinguish the nature of the blacks. In times like these, with all these criminals, there is need for more police to ensure security on the streets.
12. The addicts have chosen their way of life, why should not isolated to further contaminate other decent people.
13. There are some exceptions, but in general, the Chinese are quite similar to each other.
14. Immigrants tend to lower the general standard of living, because they are willing to perform more manual work and live at much lower levels than average.
15. The Chinese do not really have a culture of their own, they tend to copy the elements that are important to the native citizens of the country in which they live.

Scale C.P.E.
1. Broad economic availability is the fundamental objective that a man must pursue in order to have a quiet life.
2. Economic problems of Southern Italy are due to the lack of discipline and honesty of the people who live there forever.
3. Should we regret the days when politicians like Mussolini were bare-chested to mow the grain.
4. The waste emergency in Campania is due to sloppiness and dirt of the Neapolitans.
5. What it lacks in Italy, in this moment of economic crisis, is a leader brave and honest, active and devoted in which people can place their trust that unites the people and take the reins of the situation.
6. A political candidate deserves the vote, when it shows a resolute man and a steady hand to delegate their responsibilities.
7. Unemployment is rampant unease, the construction of a plant such as gas turbines here in Prescott partially solve the problem.
8. This whole unused campaign should be cementified for the purpose of industrial development in our area.
9. The main problem of our country is due to nothing weighing on the shoulders of those who work hard.
10. The men, unlike women, are naturally more prone to political activity.
11. We cannot solve all the problems of the current political and economic situation, better think about your private affairs.
12. The children should learn as soon as possible the value of money.
13. The depressions are like a headache or stomach ache occasionally, it is natural that the healthier society he has from time to time.
14. The young people sometimes rebellious ideas, but becoming adults should overcome them and settle down.
15. Whether we like it or not, you cannot help but admire men like Berlusconi, who has surpassed all competition on the road to success.

Scale F
1. Italy is moving away so the true Italian way of life that may be necessary to use force to restore it.
2. He who does not feel affection, eternal gratitude and respect for his parents is a despicable individual.
3. To learn how to work effectively it is essential that leaders explain in detail what needs to be done and how to do it.
4. Everyone should have a deep faith in a supernatural force, to which he devotes obedience and whose decisions does not put in question.
5. Acting in any way to the surface, men are interested in women for one reason only.
6. No insult to our honor should go unpunished.
7. Obedience and respect for authority are the most important virtues children should learn.
8. Given that human nature is what it is, there will always be wars and conflicts.
9. Falls to look good in human nature never do anything without worrying about their own benefit.
10. The sexual crimes, such as rape and pitfalls against children deserve a punishment greater than the mere holding these criminals should be flogged in the public square.
11. The youth needs above strict discipline, determination, and willingness to work and fight for family and country.
12. The people can be divided into two distinct classes: the weak and the strong.
221 subjects were examined, 148 of them were subjected to the questionnaire.

Qualitative part: interview
After the opinion scales there is an interview about the specific life context of the subjects, with questions about survey’s topic, to clarify and deepen which context we can find in Presenzano. Without considering national politics, neither superficial conservatism, we will try to understand which man presenzanese is, what should be the change of actual situation, how he perceives his fellow citizens, how he perceives uncertainly avoidance and news and how he can
take reality’s possibilities and shape them at least with his imagination.

Questions:
The emigration of young people in recent years has reached the highest peaks, how do you think we should tackle this problem?
Presenzano is one of the richest municipalities of Alto Casertano, do you believe that our living conditions could be better and if so, what do you believe is due degradation?
Have you ever thought about a kind of ideal society to live in and if so, what are its main features?
What is democracy for you?
Do you consider a necessary need for change at the social level and if so, what kind of change do you believe and hope can be made effective?
What do you think of your fellow citizens?

Projective questions:
A projective question is a free answer question which must be answered with a few words and which relates events or unusual experiences that are likely to have an emotional significance for the individual.

These are the questions posed to subjects
1) What mood is unpleasant or disturbing?
2) What desires are often difficult to control?
3) What great men, past or present, you admire the most?
4) What could make a person crazy?
5) What do you consider the worst crimes a person can commit?
6) What experiences make you feel embarrassed?
7) How would you spend your last six months of life?
8) What experiences inspire you a greater sense of reverence?
The projective questions are sometimes called “indirect questions” because the subject is rarely aware of the implications of his answers and because interpretations do not consider answers on their surfaces, but they seek to discover the deepest dynamic sources beyond the literal meaning of the response. These questions have been asked as a result of the questionnaire and questions about the social context of the country, to people who presumably would be part of the so-called uptown, or at least not part of the jr. high graduation, and who gave special answers.

The picture

The image above is my artefact, and it was shown to the vision of all subjects at the end of the interview, with the aim of being able to understand whether there were substantial differences between the visions of those potentially fascist and democratic parties. I asked to each one: what do you associates this picture to? (memories, associations of various kinds); Would you define it pleasant or disturbing?

Results

From the quantitative part of the study, concerning the scores obtained from the survey, it emerges that 64% of the subjects was found to be on average with potential fascist; 18% with potential extremely fascist; 12% on average Democrat; 6% extremely democratic. Having collected data about age, gender and educational qualification of people, it was possible to compare and combine the latter has the purpose of clarifying assonance or dissonance between the results of the questionnaire. Those with low scores will be included in the following table, which indicate respectively the number of the subject, age, sex, educational qualification, working situation / economic, score, reaction to the image (+ positive, - negative, I indifferent, * ideology).

Subjects with high scoring results show extremely fascist potential and will be included in the following table, which will indicate respectively the number of the subject, age, sex, educational qualification, working situation / economic, score, reaction to the image (+ positive, - negative, I indifferent, * ideology).

Subjects with low scores on the scales of the survey show variables age, they share a certain amount of education, they are all graduates and many degreeed. Most of them are males, but this is presumed to be due to the cultural context, a general difficulty of conceiving the woman as an independent individual. These subjects are also united by the sensations stimulated in them by the perception of the image: almost all, in fact, they felt positive feelings associated with a strong imaginative ability. Most of these people are economically independent, someone works abroad except for the students, and not surprisingly this point is underlined in many of their interviews; “If you're independent, you are not enslaved and blackmailed”.

Unlike these, people who are highly affected by prejudices seem to be distributed among peaks of age, in fact we found a large number of over 60’s retirees and a group of boys, some of them even minors, among 17 and 20 years. Among these 27 people just 4 are graduated, the rest is split between first school graduation and junior high school graduation; so we can underline a substantial difference between the two groups, also defined by education degree. Referring to the working context, we can find unemployed, common employees and retirees. About the vision of the image, most of all considered it unpleasant or disturbing because unable to define it and just a quarter of remaining ones also perceived its ideological aspect, just as if their imaginative luggage was made up exclusively of fixed imagery: most of all, in fact, saw it as the Virgin Mary, the Sacred Heart of Mary or essentially transposed a religious authority in the picture, which inspires them fear and a certain degree of security at the same time.

The qualitative study shows the difference between people with high scores and people with low ones. First ones, though in the minority, showed common characteristics: a general openness to dialogue, capacity of intellectualization of reality, critical thinking skills against the social structure. All these factors result in a general way of conceiving the existence and relationships with others that refers to values of accomplishment; these people give obvious importance to emotionality, often pursue the ideals of freedom and emancipation, often do not conform to established canon, recognizing the value of autonomy, criticizing the tax authorities, showing open and curious towards the others,
also having a clear concept of democracy. They showed large openness about the picture, great imaginative ability and they defined it pleasant and relaxing; they manage to have a contact at the level of feelings, they know to describe them, but this is due to the fact that these individuals were generally more interested in their emotional world and their way of perceiving reality. They leave room for the imagination, making references to concepts, linking it to something infinite and unlimited, going beyond the boundaries of the visible. People with a high score results, instead, showed common characteristics but in totally opposition with the first ones: uncritical acceptance of the status quo, delegation of responsibility to the political representatives, significant lack of imaginative ability.

In general, these subjects are frightened by the show different from anything that does not have a clear tendency to submission, they are basically misogynistic, they pursue highly conformist values, such as success, money, fame and power, in line with the trends of the existing social structure, driven by irrational beliefs about human nature, considering other people as threats, that is a clear sign of their ethnocentrism. expressed mostly reactions of disgust and bewilderment, removal and general misunderstanding. In line with their way of conceiving reality, other people, the place where they live, these subjects seem to be not open to the new, but on the contrary highly frightened, scared, with a more general non-acceptance, which upsets them and annoys them. Just as for immigrants. In addition, except for a single subject, all those who caught only the ideological aspect of the image belong to the group of subjects with a high score; this type of look is characterized by a transposition in the vision of a general need for security and submission.

So strong is the relationship between the two phases of the study, that show us how perception is influenced by a myriad of cultural, social, economic or behavioral factors; it is important to underline the emancipative aspect of culture, and how the entire social structure plays an essential role in individual life to have a new look and new methods to approach the world: a way to allow a new and free relation with reality, finally worthy of a man.

References


Figure 1: The image was shown to the vision of all subjects.
### Subjects with a low score

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### Strong fascist potential

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<td>269</td>
<td>*</td>
</tr>
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Verbalization of Music and Sound Between Poeticity and Aesthetic Evaluation

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Abstract
This paper explores how noun phrases in written discourse about popular music may be used as communicative strategies to describe musical impressions while encoding aesthetic evaluation to an audience. The study reported here concentrates on music reviews in German music magazines, adopting an exploratory qualitative corpus-based approach. 814 music-related quotations were obtained from 215 music reviews. Subsequently, a content-based descriptive linguistic analysis of the findings was carried out, taking into account lexical, structural and semantic aspects. This showed a remarkable trend: namely, the use of language in popular music reviews is creative and innovative rather than conventional and stereotype.

Keywords: verbalization of music, speech about music, verbal aesthetic evaluation, popular music, music reviews, noun phrases, figures of speech, poeticity

Background
Music grooves more than we can put into words. It is widely held that what music evokes or expresses cannot be named or captured by terms and concepts in the exact way it is felt or perceived. For the listener, music and sound are a pre-linguistic experience. The act of identifying and reporting what one considers to be beautiful, moving or aesthetically significant within a piece of music would appear to be just as difficult as describing the precise emotions the music evokes.

Accordingly, it may be deduced that the semantic properties of language are insufficient to denote the core of musical sense or expression. Nevertheless, it is evident that speech about music — verbalization, communication, discourse — is an essential part of music culture and musical life. Furthermore, it is an important aspect of research in music aesthetics. Some experimental and empirical studies focus on the enquiry or scaling of verbal attributes in relation to the aesthetic evaluation of music or classification of sound (e.g. Istók et al., 2009; von Bismarck, 1974). Others use descriptive analysis in order to explore semantic fields, textual functions or conceptual metaphors (e.g. Grutschus, 2009; Thim-Mabrey, 2002; Störel, 1997).

Speech about Music

In music there is both meaning and logical sequence, but in a musical sense; it is a language we speak and understand, but which we are unable to translate. (Hanslick, 1891, p. 71)

I didn’t mean to twist and shout, something slipped and it just popped out. (Art Brut, 2009)

Verbalization Eduard Hanslick emphasized that musical beauty lies intrinsically within its form. In his book Vom Musikalisch-Schönen he opposed the notion of “aesthetics as founded on feelings” (Hanslick, 1891, p. 15), asserting that music represents nothing outside of itself: “The essence of music is sound and motion.” (ibid., p. 67) Still, musical forms do not dispense with meaning and logical structure but these are music inherent components rooted in the composer’s “acoustic idea” (ibid.). Music consists of successive forms created by sound, and these alone frame its subject, not the representation of a feeling. Hanslick further argues that there is no subject outside of the musical form that warrants study:

“The query of ‘what’ is the subject of the music, must necessarily be answerable in words, if music really has a ‘subject’ because an ‘indefinite subject’ upon which everyone puts a different construction, which can only be felt and not translated is not a subject as we have defined it.” (ibid., p.162)

According to Hanslick, unlike visual art, music does not admit verbal description without being metaphorical. Consequently, we are obliged to speak of it either in technical terms or with rhetorical means of “poetic fiction”. Thus he concludes: “All the fantastic descriptions, characterizations and periphrases are either metaphorical or false.” (ibid., p. 70)

Communication Although Hanslick’s tone is polemic and essentialist, his argument has had broad implications on the field of music theory, analysis and criticism. The juxtaposition of two dichotomous linguistic approaches in regard to the aesthetics of music or its features — technical metalanguage and figurative discourse have become paradigmatic and continues to be discussed until today (see Tadday, 1997). Beyond this controversy, it is evident that speech and discourse about music are omnipresent in contemporary cultural practice, regardless of musical genre or style.

A more pragmatic approach was adopted by ethnomusicology in the late 70s and early 80s. According to Steven Feld (1984), music is “consumed” in the sense that it is “(...) socially interpreted as meaningfully structured, produced, performed, and displayed by varieties of prepared, invested, or otherwise historically situated actors.” (ibid., p. 1) Taking into account this fundamentally social embedment of music, its verbalization is integrated into the communicational acts of social activity and social indexicality. This perspective is based on the fact that people write and talk about music anyhow. Moreover, it is committed to a social constructionist concept that
reciprocally and interactively relates music and communication about it.

“[M]usic interacts with naturally occurring verbal discourse, not only in song texts, verbal art, and the prosodic, musical structuring of speech, but also in the interpretive, theoretical, and evaluative discourses surrounding musical experiences.” (Feld & Fox, 1994, p. 31)

Feld’s approach emphasizes the pragmatic ways music and verbal experience are reciprocally intertwined in a complex process (ibid., p. 33). Hence, speech about any aspects of music — that, denoting or describing sonic or musical elements, structures and performances, aesthetic, emotional and social experience, appreciation or value — is considered to be integral to musical discourse within the “music communication process” (Feld, 1984). In this concern, any verbal reference to x over {MUSIC} either through metalanguage or metaphor has a specific semantic meaning that is interpreted in the specific context of its utterance.

**Discourse** A common place of public discourse about music since the beginning of the 19th century was established through the textual setting of music criticism. The communicational purpose of this format originally was seen in formulating intersubjective aesthetic judgments on the value of a piece of music in written language. In a broad sense, the corpus of this study, based on music reviews in the field of popular music culture, can be seen as positioned in this paradigmatic context. However, this suggests narrow historical perspective in comparison to the contemporary situation, where music criticism comprises a broad journalistic genre within the activities of music journalism. Publication media is either print or online (newspapers, specific magazines, blogs, platforms and so forth).

From a linguistic point of view, music reviews constitute a conventional text type following exemplary textual style, therefore also including a branch of prototypical speech acts and linguistic markers. Its original communicative purposes mentioned above vary, particularly in popular culture, in relation to the respective medium, its popularity and audience, in addition to musical genre and style.

Music reviews in popular music culture represent the largest proportion of music criticism production and must be distinguished from “classical” music criticism (whose claim is to give an auctorial aesthetic judgment on the merits of its subject). With regard to the discursive function of music reviews in popular culture, two underlying theoretical positions can be summarized: One derives from a critical standpoint that considers music reviews to be a more or less complex type of advertising in the sense of a “consumer guide” in relation to the musical product. Seen as such, they constitute a branch of the marketing strategies within the music industry (Wicke, 1997). The other view, according to researchers in the Cultural Studies (e.g., Hebdige, 1979), sees music reviews as representing a constitutive organ to generate and negotiate semiotic, social and discursive meaning along pop-/subcultural emergence. This includes marketing strategies as much as the creation or the strengthening of a dominant discourse. In addition, lifestyle and fashion values are intertwined with musical concerns. The language applied in this signifying process encodes a wealth of ambiguous links and cross-references in a complex configuration of cultural codes and signs.

In both perspectives, writing about music shows a lack of aesthetic preoccupation compared to the “classical” task of music criticism. In fact, verbal strategies devoted to descriptions of aesthetic components of music converge with rhetorical and stylistic ambition (see discussion). Since in this context the technical metalanguage of music analysis can be disregarded, language use in music description tends to be idiosyncratic and “creative” rather than stereotype.

**Poeticity and Reference**

Linguistic creativity or productivity as stylistic strategies within the verbalization of music can be traced considering the communication functions of language. In relation to these, Roman Jakobson (1960) introduced the concept of the *aesthetic/poetic function* of language, thus classifying particular types of speech acts, which predominantly communicate “the message for its own sake” (ibid., p. 356). In other words, the stress of the verbal message (“set”/Einstellung) lies on the formal/structural side of language, on the inner material of the linguistic sign(s). It thus becomes apparent that the sign is not identical with its referent, the referential function is narrowed or modified. This assumption — to put it briefly — is mostly expressed in the so-called tropes or figures of speech where the features of the linguistic sign become self-referential, autonomous and ambiguous. (ibid.) In fact, the aesthetic function coincides with “factually descriptive, affective, and interpersonal meanings, which are extra-linguistically oriented” (Alm-Arvius, 2008, p. 1).

Thus, to some degree, form and meaning converge, as a result of which it is difficult and complex to paraphrase or extract the sense of it or trace the extra-linguistic references.

**Method/Corpus**

The aim of this study was to explore how noun phrases in written discourse about popular music may be used as communicative strategies to describe musical impressions through non-technical words while encoding aesthetic evaluation to an audience. Therefore, a qualitative corpus-based approach has been adopted and a descriptive linguistic discussion of the most relevant verbal strategies has been conducted in order to subsequently realizing qualitative-quantitative study.

The corpus reported here comprises of 215 randomly selected music reviews from 7 different German music magazines from pop-/subcultural contexts. In the selection process, importance was attached to draw a heterogenic sample regarding the categories “popularity” and cultural “specificity” of genre or style. To this end, based on circulation and number of readers the magazines considered were the following: (from high circulation to low) Spex [SP], Intro [IN], Uncleally’s [US] (Pop), De:Bug [DB], Raveline
[RL] (Electro), Trust [TR], OX [OX] (DIY/Punk). Out of these, 814 noun-phrases (NPs), 814 heads out of NPs – referentially related to music – were obtained within a total of 1847 tokens. These were organized alphabetically by the head of the phrase. All NPs are compound by a nominal head (NP [N]) and an attributive adjective (or participle) (NP [adj-N]), adjective phrase (or participle phrase) (NP [AP [adv-A]-N]); all determiners [Det] were filtered. One NP constitutes a single quotation. Furthermore, each quotation entry serves as an indexical reference to the initial text within the corpus and its bibliographic source (see table 1-3): e.g. (Index) SP3517 = “SP35 | Janson, G. (2004). Ian Pooley, Souvenirs. Ministry Of Sound/Pooled Musik/Edel; Fabrice Lig, My 4 Stars. Kanzleramt/Rough Trade Distribution, (p. 104). In Spex. Magazin für Popkultur. 276, 05/2004.” (Bär, 2011, p. 142)

Table 1: Quotations sample for [N] <beat->

<table>
<thead>
<tr>
<th>Index</th>
<th>quotation/occurrence</th>
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<tbody>
<tr>
<td>SP</td>
<td>unprätentiöser altschuliger Beat</td>
</tr>
<tr>
<td>RL</td>
<td>dick cooler Beat</td>
</tr>
<tr>
<td>RL</td>
<td>direkten Beat</td>
</tr>
<tr>
<td>IN</td>
<td>dezent elektronische Beats</td>
</tr>
<tr>
<td>RL</td>
<td>locker grooviger Beat</td>
</tr>
<tr>
<td>SP</td>
<td>hergesampelte Beat</td>
</tr>
<tr>
<td>SP</td>
<td>echt killer Beat</td>
</tr>
<tr>
<td>SP</td>
<td>knorpelige Beat</td>
</tr>
<tr>
<td>RL</td>
<td>ruhiger solider Beat</td>
</tr>
<tr>
<td>RL</td>
<td>strammer Beat</td>
</tr>
<tr>
<td>RL</td>
<td>treibender Beat</td>
</tr>
<tr>
<td>RL</td>
<td>ungerade Beat</td>
</tr>
<tr>
<td>US</td>
<td>knarzig verschrobene Beat</td>
</tr>
<tr>
<td>SP</td>
<td>geschmeidig-weiche Beat</td>
</tr>
<tr>
<td>SP</td>
<td>wummernde Beat</td>
</tr>
<tr>
<td>SP</td>
<td>zeitgenössischer Beat</td>
</tr>
<tr>
<td>SP</td>
<td>nervös zusammen-geschnippselte Beats</td>
</tr>
<tr>
<td>US</td>
<td>chillige Elektro Beats</td>
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</table>

Table 2: Quotations sample for [N] <sound->

<table>
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<tr>
<th>Index</th>
<th>quotation/occurrence</th>
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<tbody>
<tr>
<td>SP</td>
<td>flächige Anglosynthie-Sounds</td>
</tr>
<tr>
<td>RL</td>
<td>synthiengeschwängter ItaloDiscoSound</td>
</tr>
<tr>
<td>RL</td>
<td>Fiep- und Knarzsounds</td>
</tr>
<tr>
<td>TR</td>
<td>typischer Knüppelsound</td>
</tr>
<tr>
<td>US</td>
<td>ruppiger LoFi-Sound</td>
</tr>
<tr>
<td>DB</td>
<td>eigenwilliger Mash-Up-Sound</td>
</tr>
<tr>
<td>US</td>
<td>altbachener Sound</td>
</tr>
<tr>
<td>TR</td>
<td>basslastiger Sound</td>
</tr>
<tr>
<td>RL</td>
<td>erdige Sounds</td>
</tr>
<tr>
<td>SP</td>
<td>taudensfall gehörter Sound</td>
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<td>SP</td>
<td>kompilierter Sound</td>
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<td>DB</td>
<td>warmer sonniger Sound</td>
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<tr>
<td>IN</td>
<td>strange Sounds</td>
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<td>SP</td>
<td>verwischter Sound</td>
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<tr>
<td>RL</td>
<td>warpender und sphärischer Sound</td>
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<tr>
<td>SP</td>
<td>„nivelliertes“ globales Soundsdesign</td>
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<tr>
<td>DB</td>
<td>minimale Soundgewänder</td>
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<tr>
<td>SP</td>
<td>Soundpartikel</td>
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<tr>
<td>DB</td>
<td>morbid verschlungene Sound- und Klang</td>
</tr>
</tbody>
</table>

Table 3: Quotations sample for [N] <sound->

Analysis/Qualitative Description

The following discussion introduces a sample of the most frequent, illustrative or idiosyncratic use of NPs to verbalize or describe — refer to — x over {MUSIC/AESTHETICS}. It was intended to adopt a corpus-based qualitative exploratory approach for the purpose of realizing a subsequent qualitative-quantitative study. The present study yet does not provide a statistically quantitative report and evaluation.

For the subsequent discussion a few auxiliary notions are useful: Given the hypotheses that verbalization of music in the framework of music reviews – at least to a certain extent – aims to give information about a potential referent in {MUSIC}, the communicative strategies are interpreted as having both a referential and an aesthetic function.
The considered adjectives and nouns (heads of the NPs) are treated as lexical units [LU]. The NPs itself are regarded as referential units [RU] in a communicational context, that is speech about music in music reviews in the pop-/subcultural context.

Three classificatory dimensions are taken into account. These concern (a) (paradigmatic) the selection of the LU including idiomatic or sociolectic LUs; (b) (syntagmatic) the specific combination or syntagmatic grouping of LUs or (c) the kind of reference being made or intended through (a) and (b) as a result of which, from a rhetorical point of view, some kind of “figures of speech” may be intended or given. Newly coined compounds show an internal structure that morphologically combines vertical and horizontal strategies. Unique idiosyncratic onomatopoeic patterns following iconic or phonotactic strategies are excluded from this study to be examined separately (e.g. Bumm-Tschack [bom’tʃak] (<bumm>/[bom]’/bumm’, <T schack>/[ʃak]’/tschack’).

It is important to mention that verbalizing strategies (a-c) in NPs are mostly intertwined regarding their linguistic structure, reference and communicative function, which is describing features of sound and evaluating aesthetically.

Paradigmatic Strategies

LUs (lexicized; standard; descriptive meaning) referring to a component of music represent the largest proportions of the nouns. The most frequent lexems by the head of the NP are: Beat (beat) (24 tokens) Sound (sound) (19 tokens), Gitarre (guitar) (19 tokens), Bass (bass) (13 tokens), Melodie (melody) (14 tokens) Gesang (vocals) (12 tokens), Stimme (voice) (9 tokens), Töne (tones) (5 tokens). Further findings (1-3 tokens) are Groove (groove), Harmonie (harmony), Hook (hook), Klangfarben (timbre), Struktur (structure), Tempo (tempo), Vibrato (vibrato), Verläufe (progression), Versatzstücke (fragments). Surprisingly, in relation to Beat, there is only one token of Rhythmus (rhythm). Moreover, subculturally coded components of music are expressed by means of word formation: Breakdowns, Breakbeat, Electro-Beat, House-Beat, Fall-Beat, New-Tech-Breakbeats, Slo-Mo-Ambient.

LUs (lexicized; standard) denoting a musical genre or style: e.g. Funk, Pop, Punk, Rock, Techno.

LUs, determinative compounds, referring to a specific musical subgenre (non-lexicized; specific sociolect; descriptive meaning): e.g. College-Rock, Crust-Core, Death-Core, Dubstep, Death-Metal, Indie-Rock, Noise-Pop, NeoFunk.

LUs, determinative ad-hoc-compounds (non-lexicized; idiosyncratic): NeoFunk, Billo-Punk, Dicke-Hose-Rock, Garage-Psych-Space-Rock. Although these newly coined occasional word formations are highly idiosyncratic within its connotations and implicitness they may also express key-concepts of a specific social discourse.

LUs, most frequent adjectives: musikalisch- (musical) (18 tokens), schön- (beautiful) (6 tokens), tief- (deep) (6 tokens), toll (great) (5 tokens), akustisch (acoustic) (4 tokens), melodisch- (melodic) (4 tokens).

According to the semantic classification of Dixon (2004, p. 3-4) the largest proportion of the attributive adjectives/participles in the corpus is expressed through PHYSICAL PROPERTY. These findings show a great heterogeneity: e.g. brüchig- (brittle, fragile), dicht- (dense), dunkel (dunkl-) (dark), fahl- (pale), feingliedrig- (slender), flüchtig- (flat), geschmeidig- (smooth), glasklar- (crystal-clear), hart- (hard), hell- (bright), kalt-(cold), karg- (barren), knorpelig- (gristly), kräftig- (robust), lieblich- (sweet), rauh- (rough), spitz- (sharp), warm- (warm), weich- (soft), wummernd- (booming), VALUE: e.g. bezauernd- (adorable), cool- (cool), elegisch- (elegiac), extravagant- (extravagant), interessant- (interesting), schön- (beautiful), stürmisch- (stormy), toll-(great), unterhaltsam- (amusing), überdurchschnittlich-, werktreue- („authentische“). HUMAN PROPENSITY: e.g. böse- (evil), ehrgeizig- (ambitious), frech- (bold), hedonistisch- (hedonistic), kindlich (childish), lakonisierend- (laconic), melancholisch- (melancholy), sarkastisch- (sarcastic), unprätenziös- (unpretentious), verzweifelt- (desperate), virtuos- (virtuoso), zart (tender), zwanglos- (casually), DIMENSION: e.g. breit- (wide), groß- (big/large), klein (small), laut- (loud), leise- (quiet), maximal- (maximum). SPEED: e.g. gedrosselt- (throttled), langsams- (slowly), treibend- (driving/dvity). POSITION: e.g. hoch (high), tief- (deep). DIFFICULTY: e.g. leicht- (easy), schwierig- (difficult).

Although adjectives/participles lexically describing PHYSI-CAL PROPERTY represent the major part, they widely overlap with VALUE, hence with the evaluation in relation to the modified or specified noun. Particularly with reference to the semantic field of TASTE and SENSATION, aesthetic evaluation and description of physical property are intertwined: e.g.

1 PHYSICAL PROPERTY bitter, negVALUE (-)
2 PHYSICAL PROPERTY süpp posVALUE (+)
3 PHYSICAL PROPERTY fahl negVALUE (-)
4 PHYSICAL PROPERTY lieblich VALUE (?)
5 PHYSICAL PROPERTY brüchig negVALUE (-)
6 PHYSICAL PROPERTY zart posVALUE (+)

Syntagmatic Strategies

Generally, the syntactic function of attributive adjectives or participles is to modify the referent of the head of NP; e.g. akustische Gitarre (acoustic guitar), schöne Texte (beautiful lyrics). In this sense, they either precise/ restrict, extend (e.g. warmer Bass) or “distort” the semantic or referential properties of the head (e.g. klimrende Zartheit).

Collocations like e.g. strong coffee or heavy rain are examined in the field of phraseology. Therein they are treated as a subcategory of phrases (idiomatic phrases/set phrases/idioms) (see Mel’čuk, 2007, p. 119-20). In the case of collocations the components selected by the speaker is restricted to a to a lesser or greater degree: “a collocation is
an observable result of SYNTAGMATIC GROUPING\(^\text{19}\) of lexems — a result of constrained lexem selection.” (ibid.) Hence, <strong>coffee</strong> cannot regularly be altered by *powerful coffee or *intense coffee; <strong>rain</strong> not by *weighty rain, though <strong>rain</strong> can be combined with other adjectives (e.g. <em>soft rain</em>, but not *<em>weak rain</em>). In contrast to phrases like <em>white elephant</em> collocational meaning is still compositional. Within the corpus, music-related quotations that can be discussed as collocations are relatively rare but existent: e.g. *warmer Bass (warm bass), fette Beats (fat beats), harter Brocken (“hard chunk/heavy load, big deal) feines Gespür (acute awareness/keen instinct), <em>offene HiHat</em> (open high-hat), <em>singende Säge (“singing saw”); musical saw</em>, zarte Töne (anschlagen) (“tender tones”); *delikate Töne (anschlagen). Other combinatory strategies are considerably more productive (see below).

In quantitative corpus linguistics the term co-occurrence is used in relation to the frequency at which two LUs occur within a sequence. Co-occurrences with significant frequency assume interdependency of the LUs; this may be taken for evidence of collocational structure. Regarding the free selection and combination of single subsequent components the quotations show either semantically “regular” (frequent, habitual, predictable) or “irregular” (rare, idiosyncratic, unpredictable) occurrences: e.g. (regular) <em>aktuelles Album</em> (latest album), <em>ektronische Effekte</em> (electronic effects), hohe Stimme (high voice), ausgewählte Stücke (special pieces of music), schöne Texte (beautiful lyrics), akustische Gitarre (acoustic guitar), laute Gitarren (loud guitars), großer Hit (“big hit”; smash hit), schöne Melodien (beautiful melodies), musikalisches Spektrum (musical spectrum), musikalisches Talent (musical talent). These examples of attributive specification is stylistically “neutral”, unmarked. Besides the fact that they constitute frequent music-related co-occurrences they don’t require further semantic assessment.

### Aesthetic strategies
In contrast, a high proportion of NPs show lexical-semantic “irregularity”, incompatibility and referential ambiguity. These lexical sequences of “striking unusualness” share a high degree of poetics, which is — in terms of Hausmann (1984, p. 339) — indexical for “Konter-Kreationen” (“counter-creations”). Nevertheless, they constitute referential units inasmuch as they are communicatively related to aspects of music. Seen as such, Konter-Kreationen within the given context, provide an important contribution to verbalizing musical experience, sound and implicit aesthetic evaluation: e.g. <em>knorpelige Beats</em> (gristly beats), karger Beatsumpf (barren beat swamp), <em>Minimale Frequenzzorgen</em> (minimal frequency orgies), <em>konkretes Geschalurre</em> (concrete buzzing), <em>winnende Gitarre</em> (whining/whimpering guitar), <em>melodische Härt</em> (melodic hardness), karge Klängfelder (barren sound fields), <em>spitz Klangfarben</em> (sharp timbres).

\(^\text{19}\) Following Mel’ëuk (2001, p. 120), “[…]there is also paradigmatic grouping of lexems, which is not directly observable, because it exists only in the brain of the speaker (…).”

zuckender Lärm (twitching noise), jammende Lyrics (whining lyrics), melancholische Orgel (melancholy organ), <em>erdige Sounds</em> (earthy sounds), feingliedrige Süßigkeit (filigree sweetness), maschinelles Wummern (machine rumbling), klierrnde Zartheit (biting/clanking tenderness).

**Konter-Kreationen**, however, are not only interesting in view of syntagmatic relations but also in regard with the intended reference. According to Jakobson the aesthetic modelling of language results from the “projection of the principle of equivalence from the axis of selection [paradigmatic] to the axis of combination [syntagmatic].” (Jakobson, 1960, p. 358) Hence, paradigmatic and syntagmatic modelling coincides with stylistic or rhetorical figures (e.g. rhythmic or prosodic metaphors, metaphorical or metonymy transfer of meaning, synesthesia, ad-hoc word formation etc.).

In a very compact and narrow sense, **Metaphors** work by conceptual transfer based on similarity between the domains [D] SOURCE [D\(_S\)] and TARGET [D\(_T\)], whereas metonymic processing relies on contiguity. However, “[i]n poetry where similarity is superinduced upon contiguity, any metonymy is slightly metaphorical and any metaphor has a metonymical tint.” (ibid., 370)

The case <em>jazzy Felder</em> (jazzy fields) e.g. uses a simple metaphor that aims to describe \(D = [\text{SOUND}]_k \to [\text{NATURE}]_k \to [\text{Felder}]_k\). Another example is karge Klängfelder (barren sound fields), which also appears to be a collocative word play, namely the alternation of the noun normally combined with karg, which is <em>Landschaft</em>: karge <em>Landschaft</em> (barren landscape). In describing \(D\), by verbal means of \(D_s\), the metaphoric act transfers a set of conceptual features from the source to the target domain. Here, the operational instrument can be interpreted as an analogical or comparative reasoning following the structure “D\(_S\) sounds like D\(_T\)” or “part of D\(_S\) sounds like D\(_T\)” (but also vice versa): e.g. <em>knorpelige Beats</em> \([\text{ANAT/ANIMAL}]_k \to [\text{ANAT/ANIMAL}]_s \to [\text{NATURE}]_s \to [\text{Felder}]_s\). An example of a more structural and less visual mapping is given in kleinfaserige Gebäude (fibrous buildings): \([\text{TEXTURE}]_k \to [\text{ANATOMICAL}]_s \to [\text{SUBTLE}]_s \to [\text{NATURE}]_s \to [\text{OBJ/ARCH}]_s \to [\text{Gebaude}]_s\). Metaphorical strategies mapping source concepts onto lexical targets are also applied in word formation: e.g. <em>Beatsumpf</em> (beat swamp) which is compound of two constitutes \(\text{Beat}_k + \text{Sumpf}_k\); \([\text{FLORA}]_s \to [\text{BEAT}]_s \to [\text{Gitarren}](\text{guitar} swamp) \([\text{FLORA}]_s \to [\text{Sumpf}]_s \to [\text{GITARREN}]_s\). The quotation <em>klapperende und klingelnde Kügelchen</em> (clattering and jingling beads) combines alliteration (onomatopoeic motivation) with analogy and metaphorical reference.

**Metonymic strategies** often follow the model of synedoche: e.g. elegisch-entrückter Bowie (elegiac and engrossed Bowie): [proper name Bowie used to describe the sound of X comparable with the musical style of David Bowie), <em>rohe Platte</em> (raw record): [totum pro parte, Platte (record) is applied to evaluate the musical sound being roh (raw)]. The quotations <em>angenehme Lässigkeit</em> (pleasant...
coolness), süßlicher Rausch (sweetish intoxication), give example on how aesthetic evaluation within subjective musical impression is mapped onto the musical expressiveness (subject) in its entirety. [M]inimale Frequenzorgien (minimal frequency orgies) e.g. combines metaphorical, metonymic and anthropomorphic motivation.

Anthropomorphic strategies generally map human characteristics onto inanimate objects. Within the findings, nouns that denote instruments or sound qualities are personified by the attribute and thereby aesthetically evaluated: e.g. wimmernde [ANIM+] Gitarre [-] (whining guitar); melancholische [ANIM+] Orgel [-] (melancholy organ), jämmernde [ANIM+] Lyrics [-] (whining lyrics), zuckender [ANIM+] Lärm [-] (twitching/quivering noise).

**Conclusion**

The intention of this study was to explore how noun phrases (mostly NP[Adj-N]) in written discourse about popular music have been used as communicative strategies to verbalize musical impressions and aesthetic evaluation. Therefore, a qualitative corpus-based approach has been adopted, comprising 814 quotations obtained from 215 music reviews in 7 German music magazines. Subsequently, a content-based linguistic discussion of the findings was carried out, taking into account lexical, structural and semantic aspects.

In regard to the problem of verbalizing music, the sceptic standpoint of Eduard Hanslick was contrasted with the pragmatic position adopted by Steven Feld. His perspective takes as a basis the actual speech and discourse about musical experience seen as a communicative fact interacting with the musical processing. Within this theoretical framework, the music-related findings reported in this paper have been discussed regarding the aesthetic function of language introduced by Roman Jakobson as being closely linked to the aesthetic evaluation of music.

In this respect, the analysis showed a considerable trend: namely, the use of noun phrases in the context of popular music reviews is complex, creative and innovative while encoding referential, aesthetic and evaluative verbal strategies.

Filling the semantic gap mentioned at the beginning fosters the creation of neologisms, unconventional or incompatible combinations of words, metaphorical and metonymic mappings. Furthermore, explicit or implicit aesthetic evaluations are encoded within these verbal means. A “warm bass” thus not only sounds different than a “thumping bass” — it also implies different aesthetic judgment.

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**References**


Creative Potential, Self-Esteem, and Self-Concept Clarity: Domains Matter

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Abstract
The literature on the relation between creativity and self-esteem is controversial. Some research results establish this relationship, while other results indicate limited association between both constructs. This lack of replication may be due to important differences across studies with regard to (1) the domains of creative potential investigated, (2) the main creative-thinking processes involved in the tasks used (e.g., divergent as opposed to synthetic-integrative thinking), as well as (3) the sub-domains of self-esteem represented in the self-esteem measures administered. We present a study that sought to investigate this hypothesis by taking into account simultaneously, multiple domains of creative potential and multiple sub-domains of self-esteem among 42 adolescents who were administered creative potential tasks in three domains (graphic, verbal and musical) and a multidimensional scale of self-esteem in five domains (e.g., academic, emotional) and a scale for self-concept clarity. Results indicated that (1) creative potential is highly domain-specific, (2) creative potential in music and verbal-literacy is moderately and negatively associated to self-concept clarity, while (3) “creative self-esteem” is only related to creative potential in the figural-graphic domain but not to the other domains of creative potential under investigation. Hence, the relationship between creative potential and self-esteem seems to depend on (1) the domain of creative expression (2) the sub-domain of self-esteem, but also (3) experts’ (used for the evaluation of the creative production) features that were not accounted for in this study. Implications of this pilot work for creativity research and interventions are discussed.

Keywords: creativity, domain generality-specificity, self-concept clarity, self-esteem, adolescence.

Introduction
Creativity is often defined as the ability to produce original and valuable work that fits within particular task or domain constraints (Runco & Jaeger, 2012; Stein, 1953; Sternberg & Lubart, 1995). Conceptually, creative thinking seems to be a general ability as is intelligence. However, knowledge related to specific creative domains is necessary in order for the creative productions to hold value in their respective disciplines. Hence, creativity also involves domain-specific sets of skills. As a result, literature on the nature of creativity being either domain-specific or domain general is controversial. Some research defines creativity as a domain specific trait (Han & Marvin, 2002) while other establishes it as a domain general trait (see, Silvia, Kaufman, & Pretz, 2009). The debate goes further when researchers consider not only domain-specific abilities but also task-specific abilities involved in creative potential (Baer, 1994). Integrating those contrasting perspectives, it is becoming increasingly acknowledged that creativity is partly domain specific and partly domain general (Baer & Kaufman, 2005; Barbot, Tan, & Grigorenko, 2013).

However, this might not be true for all developmental stages. During childhood creativity may be more a general ability whilst it is presumably during adolescence that creativity may become a more domain-specific ability (Barbot & Lubart, 2012) with the apparition of new domains in which the adolescent commits (Plucker & Beghetto, 2004). These apparent structural changes in the nature of creativity (Rothenberg, 1990) are associated with profound psychosocial changes. During adolescence, individuals undergo a process of identity construction leading to the reorganization of the self, which may have a major incidence in the development of creativity (Barbot, 2008).

Indeed, among many cognitive, conative and environmental factors, which have been found to be related to creativity, past research has investigated self-esteem and other dimensions of the self, as potential correlates of creativity (e.g., Gerrard, Poteat, & Ironsmith, 2010; Hoff, 2005). Historically, this research stems from biographical descriptions of the concept of creativity by individuals renowned for their creative accomplishments, interpreting creativity as a way to express their self, or as a mechanism of self-actualization (Maslow, 1968). However, this research line has proved to be controversial. For example, Goldsmith and Matheley (1988) found that creativity and self-esteem are positively correlated. In contrast, Jaquish and Ripple (1980)
did not find such relationship. Similar to the domain generality-specificity controversy in the creativity field, lack of replication of prior research results may be due to divergences regarding the sub-domains of self-esteem represented in the self-esteem measures administered, as well as the differences in domains of creativity measured. Another explanation for the lack of external validity of previous creativity-self-relationship studies has to do with the various age groups tested. Indeed, it is possible that self-esteem and creativity show different patterns of association depending on the developmental stage taking into consideration.

In particular, self-esteem and self-concept clarity experience a dramatic decrease in the transition from childhood to adolescence. With the onset of puberty and the increased social pressure to be accepted by peers, teens engage in the formation of their identities, which are often associated with confusion regarding the self and a loss of self-esteem. This identity formation process often translates into unclear or unstable self-concepts (self concept clarity) due to the reorganization of the self and the frequent shifts in interests and commitment to domains used as the basis of self-definition.

Unfortunately, recent research has not extensively explored the relationship between self-esteem, self-concept clarity and creativity in adolescence. This research area appears promising because adolescence is a crucial time for both identity and creativity development (Barbot, 2008) and understanding the relationship between creativity and various dimensions of the self represents a potential avenue for the development of creativity-based intervention that may support the formation of one’s identity and positive self-esteem.

Towards this endeavor, the present pilot study sought to estimate the association between creative potential and both the valence (esteem) and clarity of the self, during the specific time of adolescence.

**Methods and Materials**

**Participants**
The sample consisted of forty-two French adolescents (20 females and 22 males). The participants had an average age of 16.2 years and were recruited in a middle-income high school in a large French city.

**Measures and Procedure**
Participants were administered three “convergent-integrative” thinking tasks (Barbot, Besançon, & Lubart, 2011; Lubart, Zenasni, & Barbot, 2013) leading to the production of creative outcomes in three domains: Verbal-Literacy (resulting in a short story) and Graphic (integrated drawing), using the Evaluation of Potential Creativity (EPoC; Lubart, Besançon, & Barbot, 2011) and a short Musical Composition, using the Musical Expression test, MET; (Barbot & Lubart, 2012b). Specifically, participants achieved their creative work as follow:

a. Verbal-Literacy: Participants were asked to formulate an original story using three given characters within 15 minutes allotted for that task (Lubart et al., 2011).
b. Graphic: Participants were presented eight heterogeneous objects (presented on a photo sheet) and asked to create an original drawing production integrating at least four of the given objects in the 15 minutes allotted for this task (Lubart et al., 2011).
c. Musical: Participants were presented with a set of instruments, both conventional and unconventional (e.g., spoons, drums, rain stick) and asked to create an original composition using a step-by-step audio sequencer recording system (Barbot & Lubart, 2012b).

Using the consensual assessment technique (CAT; Amabile, 1982) two trained independent experts scored the resulting productions. Productions were presented randomly within each domain block and scored independently by each rater for creativity on a Likert scale (1- low creativity; 7- high creativity). Productions with an inter-rater disagreement of two or more points (about 20% of the production sample) were rescored using the same procedure. As a result, inter-scorer reliability was acceptable (with intra class correlation coefficients of .60, .78, .84 for music, drawing and story, respectively) and scores for each production were computed by averaging the ratings provided by each rater.

In addition to the creative production tasks in each domain, participants were administered a multi-dimensional scale of self-esteem (EMES; Barbot, Oubrayrie & Safont, in preparation). The scale includes 40 items measuring self-esteem within several sub-domains (i.e. physical, academic, social, etc.) including a scale of creative self-esteem, similar to the construct of creative self-efficacy (Beghetto, 2006; Beghetto & Kaufman, 2011; Kaufman, 2012). The EMES scales showed a high level of internal consistency.

Finally, we administered the Rosenberg self-esteem scale (Rosenberg, 1965) as well as a Self-Concept Clarity (SCS) scale (Campbell et al., 1996) which both showed high reliability.

**Results**
The correlation matrix presented in Table 1 indicates several significant relationships between domains of creativity, self-concept clarity and sub-domains of self-esteem. In particular, (1) creative potential in music and verbal-literacy were found to be moderately and negatively associated with self-concept-clarity, and (2) creative self-esteem is only related to creative potential in the graphic domain. Additionally, analyses showed no significant correlation between the different domains of creativity tested supporting the hypothesis that creativity is mainly a domain specific ability.

Complementary analyses suggest that the patterns of correlations between self-esteem and the various creative potential tasks greatly vary depending on which expert’s scores are used as a basis of the analyses. That is, when considering expert’s judgments on the creativity of the production independently (rather than using the consensual scores obtained with the CAT), associations between creativity and self-esteem differ greatly.
### Table 1: Correlations.

<table>
<thead>
<tr>
<th>Self Domain</th>
<th>Creativity Domain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Music</td>
</tr>
<tr>
<td>SC Clarity</td>
<td>-.33</td>
</tr>
<tr>
<td>General (RSE)</td>
<td>.04</td>
</tr>
<tr>
<td>Creative</td>
<td>.00</td>
</tr>
<tr>
<td>Emotional</td>
<td>-.11</td>
</tr>
<tr>
<td>Future</td>
<td>-.28</td>
</tr>
<tr>
<td>Physical</td>
<td>-.19</td>
</tr>
<tr>
<td>Academic</td>
<td>.06</td>
</tr>
<tr>
<td>Social</td>
<td>-.16</td>
</tr>
</tbody>
</table>

Note. Bolded coefficients are significant at p < .05

### Discussion

The objective of our study was to explore the relationship between self-concept clarity, multiple sub-domains of self-esteem and creativity in three domains. From our pilot data, our results first suggested that creativity is mostly a domain specific ability. This means that people with high levels of creativity in one domain do not necessarily show such levels across all domains (Baer, 1998). With regard to the relation between creativity and multiple dimensions of the self, we observed that adolescents who score high on a creative drawing task tend to show a higher creative self-esteem. It is important to note that the creative self-esteem scale in this study mostly taps into feelings of self-efficacy in artistic domains, and especially visual art sub-domains, which might explain the larger correlation observed given the greater concordance between domains represented in the creative self-esteem scale and the drawing task.

Unexpectedly, self-concept clarity was negatively and moderately associated with creativity in music and writing, suggesting that adolescents with an unclear sense of their identity showed a greater creative potential in those domains. This result may be interpreted in light of creative personality literature suggesting that highly creative individuals tend to be more open to non-conventional ideas and therefore may not see themselves with a clear distinct identity, but instead are very explorative with themselves and the world in general (Jaussi, Randel, & Dionne, 2007). Hence, this result also calls into question the nature of self-concept clarity and its association with several identity processes that may underline creativity. For example, it has been shown that the process of identity exploration (exploring a range of alternative commitments in significant domains of life) is a significant predictor of divergent thinking in several domains (Barbot, 2008; Dollinger, Clancy Dollinger, & Centeno, 2005), and identity exploration reflects a lack of affirmed commitment (hence leading to exploring what one can and wants to be) that could theoretically lead to a lack of self-concept clarity.

Finally, we observed very different patterns of association between self-esteem and creativity, according to the expert used as a basis of creativity scores. As illustrated in related work, this result suggests that various experts may have different standards when assessing creativity according to their respective background and training (Barbot, Tan, Randi, Santa-Donato, & Grigorenko, 2012). It also suggests that some other factors of expert raters, such as emotional factors for which experts may be more or less sensitive, may intervene and indirectly "inflate" or "deflate" the observed association between creativity and self-esteem. These differences in results related to inter-individual differences in creativity ratings may also explain some inconsistencies in the results of both the creativity domain generality-specificity field, and of creativity-self relationship studies.

Although the results presented here are promising, it is important to acknowledge the pilot nature of this work and the need for extensions that must pay attention to (1) increasing the sample size, (2) testing creativity across more domains, as well as (3) using a larger judge sample with domain-specific expertise.

Besides limitations, this pilot study suggests several important directions for future work to capture the “true” nature of the relationship between creative potential, self-esteem, and self-concept clarity. First, considerable research efforts are needed to better identify and control for inter-individual differences in creativity ratings, so that consensual creativity scores are unequivocal and can be used meaningfully in subsequent analyses. This could be achieved by relying on multiple groups of experts with diverse backgrounds, training, and personality features, based on which only the consensual portion of the ratings would be used for analyses with criterion measures (such as self-esteem measures).

Second, because creativity appears mainly domain specific, it seems important to study creativity in multiple domains (hence more than the three creative domains represented in this study) to better estimate an individual’s creative potential and its correlates (Barbot et al., 2011). The same is true for the need to take into account multiple domains of self-esteem including multiple sub-domains of creative self-esteem or self-efficacy (Beghetto, 2006; Beghetto & Kaufman, 2011; Kaufman, 2012) to increase the concordance between the domains covered in the self-report measures and the domains of creativity investigated.

Finally, provided that the issues above can be addressed, an important direction for future work will be to disentangle which of creativity or the self is the cause versus the consequence of the other construct. In other words, does creativity underline self-esteem in specific domains or does self-esteem in specific domains best predict creativity? This question is of particular importance for the development of creativity-based intervention designed to improve various self and identity processes by capitalizing on individuals' creative potential in targeted domains.
References


The Combined Effect of Perceptual and Conceptual Dimensions on Product Design Aesthetics

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Abstract

In design research perceptual features of a design such as unity-in-variety as well as conceptual properties (whether the design is a good instantiation of designer’s intentions) have been found to affect the aesthetic experience independently. In the course of a research design using systematic manipulations of USB stick designs in three subsequent phases, we have been able to formally relate these distinct dimensions, after having assessed optimal levels for them separately. We have found that both perceptual and perceptual features impact on aesthetic liking, but the perceptual dimension is more decisive. We also encountered a positive interaction, indicating that effects of dimensions are interdependent to an extent.

Keywords: design aesthetics; unity-in-variety; design and intention; Unified Model of Aesthetics

Introduction

The question as to what determines our aesthetic experience of objects has been occupying scholars for ages. Following in the footsteps of Fechner (1876) and later Berlyne (1971) the tradition of empirical aesthetics has turned to empirically tackling this issue through systematic experimentation. Although many researchers within this tradition tended (and still tend) to focus on art, its tenets can easily be extended to any object that could provoke sensory delight – especially designed products (Hekkert, 2006).

Initially this branch of research primarily focused on objects’ structural, perceptual features (e.g. Boselie & Leeuwenburg, 1985; Cupchik & Berlyne, 1971), but gradually it considerably broadened its scope to different aspects as well – like prototypicality, meaning, social significance – thereby paying heed to the intricately complex and multidimensional nature of the aesthetic experience (i.a. Bornstein, 1989; Leder, Carbon & Ripsas, 2006; Temme 1992; Whitfield, 1983). However, to date much of the individual studies tend to focus on particular well-defined aspects, leaving others deliberately out of the equation. This leads to an in-depth understanding of the aesthetic effects of the considered aspects, but the result is a set of thorough, but fragmented explorations.

For this reason Hekkert (2014) has coined the Unified Model of Aesthetics (UMA) of product design. The model attempts to integrate the various dimensions that impact our aesthetic experience of products. It rests on the main assumption that people’s behavior is guided by an urge for safety as well as for accomplishment. When a balance of these countervailing forces is struck, we experience aesthetic pleasure. However, these urges can manifest themselves in various ways. Therefore, the model accommodates for multiple dimensions. On the perceptual plane, people seek for unity as well as variety in the sensorial stimuli they encounter (which will be elaborated below). As concerns cognitive processing, the urge for typicality (familiarity, recognizability) is counterbalanced by a drive for novelty to avoid repetition and tedium. Furthermore, as products figure in interactions between people, on the social level we want products to signal our belonging to a group (connectedness), while also offering us the means to distinguish ourselves as an individual (autonomy). In addition to these balances, it is characteristic for products to serve certain practical purposes. Hence, they can be conceived as a means to instantiate a particular intention. In this sense, to a varying extent they can be deemed an appropriate means, which in turn is also quite likely to affect aesthetic appreciation. Therefore, a fourth, conceptual level can be added to the model.

The various levels of UMA effectively refer to different features constituting the design. As such, they will impact on the aesthetic appreciation of the product in their own specific way. However, by no means does this imply that they are comparably decisive. On the contrary, when considering the aesthetic experience in confrontation with a product, it is rather probable that some dimensions weigh in a lot more than others. Moreover, as the dimensions are jointly operating in a given product, they exert their individual effects in conjunction. For that reason, these effects are arguably not independent. It is well imaginable that the impact on aesthetic appreciation of one dimension is affected

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20 For a thorough discussion of the model, we kindly refer the reader to Hekkert (2014). On these pages we will suffice with a concise introduction to the central tenets of the model.
by the impact of another (Hekkert, 2014). To date, such interrelations have not empirically been explored systematically in the frame of UMA, but – as mentioned – they are also largely lacking from the empirical aesthetics literature in general.

This study makes a first attempt towards a formal integration of various dimensions affecting the aesthetic experience by empirically testing the relations between distinct levels of UMA through systematic manipulation. In particular, we will establish the relative effects of and interaction between the perceptual and the conceptual level. Although any combination of levels is imaginable and is likely to render substantial insights, we chose to include these levels in the present study because they are far apart in the model and therefore refer to very distinct features of a design. The perceptual level denotes the sheer sensorial processing of tangible design features, whereas appreciation on the conceptual plane implies reflexive interpretation. Hence, these dimensions are more likely to operate independently. In that sense, with respect to interaction effects, the selection of these levels in particular offers a strong test.

**Research Design**

As hinted at in the introduction, per level of UMA it is possible to identify an optimal state – that is, a state (in many levels it concerns a balance) that maximizes the aesthetic appreciation for that dimension of the design (Hekkert, 2006; 2014). However, it needs little argument that these levels vary in different ways. This is why we decided to conduct the study through three consecutive phases. Two pre-test phases were designed to separately establish optimal states of the two dimensions under scrutiny. Afterwards a main test was conducted to integrate the levels. The general design of the study is presented in the diagram below.

![Fig 1](image)

**Figure 1: Research phases**

In the following sections we will discuss the distinct phases consecutively, covering literature, research design and results per phase. In this section we will address the features that are in common to the three phases.

Throughout the different phases, systematic manipulations from a single product category were used as stimulus material – USB memory sticks. This choice was informed by the limited number of basic elements of this product type, which allowed for feasible and realistic manipulations, and made 3D rendering manageable too. Also, being a technological product, it was expected to allow for the introduction of additional elements (like indicator lights,…) and specific purposes (in the form of a special functionality). The manipulations were done by one of the authors, who is a trained designer and has experience with 3D modeling and rendering. The designs were developed virtually only (so they were not physically made) and presented to the participants as images on paper. The orientation of the designs and their backgrounds were kept constant over the phases.

The participants were invariably design students of Delft University of Technology. Apart from the practical merit of accessibility, this group was selected for its homogeneity. By keeping differences in expertise and age more or less constant, we could compare findings across the phases.

**Conceptual Level**

**Design as an Instantiation of an Intention**

An artifact by definition is made out of an intention. Knowing that intention affects the opinion people contrive of the artifact, as has been illustrated by numerous studies (i.a. Pfaff & Gibbs, 1997; Temme, 1992; Specht & Van Dewerker, 2008). This arguably applies no more to products than to other artifacts, although it is probably more apparent. For products are made to serve particular purposes. Hence, a product’s design could be conceived as a means of communicating that intention from the designer to the users, who in turn make an interpretation (Crilly, 2011). This communication does not necessarily run smoothly. The recipient of the message may be incapable of interpreting the message adequately and, as a consequence, use the product not as intended. Or the user does get the message, but does not recognize the design to be a suitable (practical, efficient, elegant,…) way of getting this across. The numerous choices and decisions made in the design process are likely to affect the user’s interpretation of the designer’s intentions. They may be deemed effective or clever in view of the product’s purposes, or otherwise obsolete, indeterminate or downright bizarre. Although this situation could already occur when the user learns the intention through inference from the product’s features, it is especially striking in those cases where the user does get an explicit clue about the product’s actual purposes – through designer’s statements, product names, instruction manuals, notes on the packaging, …. In those cases, the user will be able to assess fairly easily whether the design as it is constitutes a good instantiation of the intention at its base, regardless of whether one thinks that intention is appropriate for a product in itself (which is more of an ethical issue). For example, a garbage bag may be designed to discourage wastefulness. One needs not endorse sustainable consumption as such to assess whether this particular bag is a good design in view of its goal. Hence, the conceptual loading of a product will affect the user’s evaluation. Although this mainly seems to be a matter of understanding
as the intention instantiﬁed by the design is not a sensorially detectable property of a design as such, it has been found to affect the aesthetic appreciation. Da Silva, Crilly and Hekkert (2014) get clear indications that a product is considered more beautiful if users think its design ﬁts with its purposes.

Pre-test 1
In the ﬁrst phase of the present study, our aim was to assess the degree to which a particular design is to be considered a good or bad instantiation of a product’s intention. More speciﬁcally, we tested how participants (n=20) would evaluate various USB memory stick designs in relation to the intention “designed to tell the user as precisely as possible how much storage capacity has already been used”. We designed eight USB stick concepts that plausibly instantiated the intention. Per concept, three images were produced – representing an empty, half full and full state, in order to provide the participant with an idea of its functioning. The following concepts were thus developed (name between brackets by way of shorthand for the ensuing discussion).- USB stick with a display showing the used space numerically (numeric).- USB stick with a display showing a growing bar as it ﬁlls up (bar).- USB stick with a display ﬁlling up with tetris blocks (tetris).- USB stick with a scale along which a button mechanically moves (scale).- USB stick with a line of red LED’s that gradually light up as it ﬁlls up (red line).- USB stick with a green, orange and red LED that light up depending on the used capacity (traffic lights).- USB stick that grows/inﬂates as it ﬁlls up (grow).- USB stick emitting light that fades down as it ﬁlls up (glow).

The designs were presented to the participants on cards. They were instructed to arrange these in line with the intention, which was mentioned explicitly in the instruction. A Friedman’s ANOVA indicated that designs were placed in signiﬁcantly different ranks ($\chi^2 (7)=56.60$, p<0.001). Mean ranks are presented in the right hand panel of table 1 (stars indicate a signiﬁcant difference (p<0.05) in ranking as compared to the precise condition based on Mann Whitney’s $U$).

On the basis of these ﬁndings we could conclude that the ‘numeric’ design is the best instantiation of the intention priming precision of information offered by the USB stick, whereas the ‘glow’ design is considered the worst. Therefore, we decided to proceed with these concepts to the subsequent phases.

Apart from the ranking assignment, respondents were also instructed to award a liking score on a 10-point scale to the various designs (higher is better). This was done for two reasons. On the one hand, in that way we could establish whether an optimal instantiation would also result in higher liking, which is expected by UMA. On the other hand – and more importantly in view of the present study’s purposes – it allowed for comparison of the results across phases. As in the ﬁnal, main study we were to assess the relative weight of the conceptual and the perceptual level in explaining aesthetic appreciation, we needed a way to ascertain that variation within both levels would be comparable. However, these levels refer to essentially different qualities of a design. Therefore, in line with a procedure introduced by Schifferstein et al. (2010), by relating them directly to liking, we could establish a common ground and benchmark variation in the levels in a comparable way.

The liking scores (only for the precision condition) are presented in the central panel of table 1. As mentioned, these were used mainly in relation to the results of the second pre-test. However, they are informative in themselves, because they tell us that although the optimal instantiation of the intention based on ranking (numeric) was not liked the best on average, the lower rankings tend to coincide with lower liking scores. Hence we ﬁnd some additional corroboration of UMA’s expectations concerning the conceptual level.

The two remaining designs differed a lot in terms of general appearance – ‘glow’ was white and quite crisp, whereas ‘numeric’ was black and it had a green led screen, which could come across as old-fashioned. Also, some respondents indicated that it made little sense that ‘glow’ dimmed down instead of lighting up. As a consequence, we altered the designs slightly. ‘Numeric’ was brought more in line stylistically with ‘glow’ (white translucent plastic with a white display shining through) and the order of ‘glow’ was turned around. These were re-tested on different participants (n=20) to ascertain reliability after the changes. With the

<table>
<thead>
<tr>
<th>Table 1: Mean ranks of concepts</th>
<th>mean rank ‘precise’</th>
<th>mean rank ‘fun’</th>
<th>mean liking ‘precise’</th>
<th>mean liking ‘fun’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glow</td>
<td>1.70</td>
<td>6.85</td>
<td>1.75</td>
<td></td>
</tr>
<tr>
<td>Traffic lights</td>
<td>2.50</td>
<td>7.32</td>
<td>5.55</td>
<td>3.85*</td>
</tr>
<tr>
<td>Grow</td>
<td>2.85</td>
<td>7.30</td>
<td>6.70</td>
<td>4.30*</td>
</tr>
<tr>
<td>Tetris</td>
<td>5.10</td>
<td>7.00</td>
<td>3.85</td>
<td>5.75</td>
</tr>
<tr>
<td>Red line</td>
<td>5.50</td>
<td>5.90</td>
<td>7.32</td>
<td>6.05</td>
</tr>
<tr>
<td>Scale</td>
<td>5.70</td>
<td>6.15</td>
<td>8.00</td>
<td>4.35*</td>
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<tr>
<td>Bar</td>
<td>5.80</td>
<td>7.15</td>
<td>7.00</td>
<td>5.70</td>
</tr>
<tr>
<td>Numeric</td>
<td>6.85</td>
<td>6.70</td>
<td>6.15</td>
<td>1.75*</td>
</tr>
</tbody>
</table>
liking score for ‘numeric’ again being higher (‘glow’=6.15 – ‘numeric’=7.80) the initial findings of pre-test 1 were confirmed, although the difference was slightly larger (1.65, t(19)=−3.12, p=0.006).

**Perceptual Level**

**Unity-in-Variety**

The principles of unity and variety have separately been very well documented in the literature. On the one hand, people seem to derive pleasure from discovering orderly patterns in the things they perceive. It is argued that our brains have evolved to appreciate unity, as it facilitates the processing of stimuli. This principle is adopted eagerly in art and design, especially through the application of the Gestalt laws, documented by behavioral psychology. Symmetry, repetition, proximity, continuity, … are used to establish coherence between the various elements that constitute an artifact (Arnheim, 1971; Wagemans et al., 2012).

On the other hand, our sensory apparatus has evolved to accommodate variety too. As our environment is made up of various elements we need an ability to detect difference and explore new information. Hence, our senses welcome some challenge in the form of variety to avoid boredom (Berlyne, 1971; Biederman & Vessel, 2006).

As a consequence, both unity and variety, although contradictory, positively affect aesthetic appreciation. In the frame of UMA, this has been acknowledged for various products and different types of perceivers (Post, Blijlevens & Hekkert, 2013).

**Pre-test 2**

After having established the suitability of the USB sticks as instantiations of an intention in the first phase, we wanted to determine the optimal balance of unity and variety in these designs. As mentioned before, we did so for reasons of comparability in view of the main study, but also it was interesting in itself to get an idea of the balance for the product category of USB sticks. Although unity and variety have both been found to affect aesthetic appreciation for a wide variety of products, the extent to which they do tends to differ depending on the product category (Post et al., 2013). In advance, there was no telling where the optimal balance would be located.

As stimulus material, the two concepts retained from pretest 1 were manipulated systematically on unity and variety. For unity, symmetry of the designs was subtly increased in three steps – by moving the position of the displayed text for the ‘numeric’ design and in the case of the ‘glow’ design by changing the part of the stick that lit up. For variety, the number of elements was increased, also in three steps – a band was put around the stick’s body in the second step, in the third step an additional indicator light was added. As a result, nine distinct manipulations were designed per USB stick concept (3 unity steps × 3 variety steps). These were presented to the participants on paper questionnaires (single image representing only the full state). Participants were split into two groups, so they would view only the nine manipulations of either ‘glow’ (n=37) or ‘numeric’ (n=40). They were requested to rate the manipulations (0-10) on three items tapping into unity (“design is orderly”, “looks unified”, “is coherent”) and three variety items (“design consists of various parts”, “presents variety”, “is rich in elements”). Scores were then averaged into a composite unity scale (Cronbach’s α=0.91) and variety scale (Cronbach’s α=0.80). Again, a liking scale was also included.

When performing a multiple linear regression analysis on liking with unity and variety as independent variables (R²=0.43), results were in line with previous studies. Both perceptual principles bore a significant positive effect on liking (unity β₁=0.69, p<0.001, variety β₂=0.29, p<0.001). Also corroborating previous findings, unity and variety were correlated negatively (r=−0.33, p<0.001).

In order to establish the optimal balance for unity and variety, we inspected the average scores of the individual manipulations for unity, variety and liking. For the purpose of clarity, these results are presented graphically in figure 2. The dots represent the various manipulations (blue for ‘glow’, orange for ‘numeric’). The tags encode the specific manipulation – ‘U’ for unity, ‘V’ for variety, ‘L’ for low, ‘M’ for medium and ‘H’ for high. (To illustrate, LU-MV means that it was manipulated to be low in unity and medium in variety.) Behind the code, the average liking score is mentioned.

**Figure 2:** Manipulations’ scores for unity and variety

It is plain to see that for both the manipulations of ‘glow’ and ‘numeric’ higher levels of perceived unity are preferred and higher variety scores lead to disapproval. We get few indications of a preference for maximization of both principles. It should be noted that this may be due to the specific manipulations we performed, though. From the positions in the graph, we can gather that the variety manipulations had the intended effect. However, for unity this is not the case. In fact, scores on unity seem to reflect
decreasing variety levels to a greater extent than systematic increases in manipulated unity. The limited distances between the unity manipulations suggest that they differed only within the variety manipulations. This probably means that the systematic manipulations of unity were too subtle in comparison with the variety manipulations. Furthermore, the larger effect of unity scores on liking might indicate that actually both unity and variety manipulations were collapsed in the eyes of the participants and to a large extent perceived in terms of unity.

Notwithstanding this methodological limitation, these data do allow us to identify the unity/variety manipulations that are deemed optimal and sub-optimal. For ‘numeric’, ‘high unity/low variety’ was liked best (7.38). In the case of ‘glow’ this was ‘medium unity/low variety’ (7.08). However, we opted for ‘high unity/low variety’ in this case as well, which was rated second best. Apart from the fact that in that way the manipulation could be held constant for both concepts, the scores it got on unity and variety were also more in line with the intended manipulation (‘medium unity/low variety’ was deemed far more unified than intended).

For the selection of the manipulations presenting sub-optimal balance, we had to take into account the liking scores of pre-test 1. As the difference in liking between the (altered) designs of ‘glow’ and ‘numeric’ amounted to 1.65, the difference between the optimal and sub-optimal unity/variety manipulations had to be of a similar order of magnitude. Hence, for ‘glow’ we found that ‘high unity/low variety’ was liked 1.66 more than ‘low unity/high variety’, which conveniently is its diametrical opposite. As in the case of the optimal manipulations, again we selected this manipulation as sub-optimal for ‘numeric’ as well. It was liked less by 1.45, which we considered sufficiently similar.

**Main Study**

Having established optimal and sub-optimal states for the conceptual as well as the perceptual level, we could move on to integrate both levels in a main research design to determine their relative weights and possible interaction in affecting the aesthetic appreciation. Four designs, retained from the second pre-test, presented the manipulations needed to do so (2 instantiations × 2 unity/variety balances).
- perceptually sub-optimal/conceptually sub-optimal (glow low unity-high variety).
- perceptually sub-optimal/conceptually sub-optimal (glow high unity-low variety).
- perceptually optimal/conceptually sub-optimal (numeric low unity-high variety).
- perceptually optimal/conceptually optimal (numeric high unity-low variety).

As we wanted to gather how beautiful these would be considered relative to one another, we used a paired comparison procedure. In other words, participants (n=85) were to compare them in pairs and indicate which they found most beautiful. Hence, six possible pairwise combinations could be formed, which were printed in a questionnaire. As in pre-test 1, it was mentioned explicitly in the instructions that it concerned “USB memory sticks designed to tell the user as precisely as possible how much storage capacity has already been used”. Also, again images of three states of used space were shown. To indicate aesthetic preference, the participants were asked to tick a box below one of the designs constituting a pair.

After the data had been gathered, per design the number of ‘wins’ of comparisons was calculated for individual participants. As a given design was compared to three others, this resulted in a scale ranging from 0 (no wins) to 3 (no losses). This variable was then regressed on whether it constituted a good instantiation and whether the unity/variety balance was optimal.

Surprisingly, this model only explained 10% of the variance in beauty (as operationalized through the number of paired comparison wins). This is a rather small proportion considering the fact that only the perceptual level was already found to explain 43% of liking in the second pre-test. Arguably, there is some difference between beauty and liking in general, but it would seem that this is mainly due to the different procedure of data collection (with paired comparisons). However, both the conceptual and the perceptual level bore a significant main effect on the number of wins (good instantiation β1=0.14, p=0.008, optimal unity/variety balance β2=0.25, p<0.001). Moreover, a significant interaction between instantiation and unity/variety was encountered (β1β2=0.16, p=0.003 – which is also quite strong relative to the main effects). Thus, we could formally establish that both levels contribute to the aesthetic experience, both independently as well as in combination.

**Discussion**

In the present study we were able to relate two aspects that have been found to affect aesthetic appreciation, but are usually considered to be of a very different order. Using a research design that comprised a careful sequence of steps and by relating these through liking scores, we managed to establish and benchmark variation of the variables involved in a comparable way. Thus, we could take a considerable step towards an integrated understanding of design aesthetics.

From the findings we can conclude that both the way in which a design instantiates the intention of the designer as well as the extent to which it is unified and varied affect its aesthetic appreciation independently. Hence, these features really are distinct and belong to different levels – not just theoretically, but also empirically.

However, it is quite clear that the perceptual level has a greater impact on the aesthetic appreciation than the conceptual level does. In other words, the impression a design makes on our senses is more decisive for the aesthetic experience than the knowledge of what the designer was aiming for. It certainly helps that a design is a clever, elegant or effective solution for a particular use, but in order to be aesthetically pleasing it should foremost strike an optimal balance in terms of the unity and variety it presents.
On that note, the significant positive interaction between the levels adds an interesting nuance. The UMA is not a merely additive model. We get a clear indication that its levels do communicate. If a design instantiates an intention suitably, it is also deemed more beautiful on the basis of its perceptual features. Or, the other way around, if a design strikes a pleasant balance of unity and variety, its conceptual quality becomes more important as well. This opens up a number of interesting hypotheses. On the one hand, it is imaginable that the other levels of the model too stand in interaction with one another. This would imply that, although the individual levels add to the aesthetic experience in their own right, a truly beautiful design should be adequate on any level. On the other hand, some levels may figure as preconditions for the others to some degree. Stated differently, only under the condition that certain levels are deemed aesthetically optimal will the others be able to reach their full effect. The current analyses do not allow for such causal inferences, but this hypothesis presents itself as a promising direction for future research.

The merit of this study lies not just with its substantive findings. In methodological respect too, it offers a fruitful influence of title information on understanding and appreciation of paintings. Acta Psychologica, 121(2), 176–198.


Influence of Social Connectedness and Autonomy on Aesthetic Pleasure for Product Designs

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Abstract
In previous research, we found that people use product designs to feel connected to and autonomous from their ‘type of people’ and when product designs do they are aesthetically pleasing. From an evolutionary perspective, product designs provide aesthetic pleasure because they help direct beneficial behavior. We argue that people can fulfill their evolutionary need for safety through product designs that make them feel connected, and the need for accomplishment through product designs that help them feel autonomous. Accordingly, we assessed whether conditions of safety and accomplishment influence the relationships of connectedness and autonomy with aesthetic pleasure. In two studies, we show that regulatory focus and risk manipulation moderate the effects of connectedness and autonomy on aesthetic pleasure for product designs.

Keywords: Aesthetic pleasure; connectedness and autonomy; product design.

Introduction
Products are used as social cues, communicating about the self to others (Belk, 1988; Dittmar, 1992; Kleine, Kleine, Kernan, 1992). For example, a person in a stylish grey raincoat is perceived as being serious while a person wearing a bright and colorful pair of sneakers is perceived as being playful. Similarly, the first person can be perceived as being a businessman while the second person is perceived to be a skater. Hence, group membership can be communicated through product designs. With regard to the latter, personality and social psychology describe an inherent social need that could explain the use of product designs to communicate group membership; the need for connectedness. The need for connectedness is described as an inherent social need that involves the desire to feel connected to others (Deci & Ryan, 2000) and have a sense of closeness with others (Brewer, 1991; Baumeister & Leary, 1995). Feeling connected to people makes the person feel safe within a social position. For example, working on a MacBook Air makes me feel connected to the Design Research community, which consequently provides me with the feeling of safety and comfort. On the other hand, people also have an inherent need to feel autonomous. The need for autonomy (Lynn & Snyder, 2002; Lynn & Harris, 1997b; Snyder & Fromkin, 1977) involves a desire to see oneself as a unique and differentiated being and as being free and in control of one self (Brewer, 1991; Deci & Ryan, 2000; Bettencourt & Sheldon, 2001; Lynn & Harris, 1997; Lynn & Snyder, 2002). This helps people to stand out and draw attention, but also provides the means to explore new social positions within an ever-changing social world. For example, I will wear a classic jacket to go with my black dress to a conference, but this jacket is bright pink. This jacket makes me feel connected to my colleagues in research, because it is professional looking; however, it also makes me feel autonomous from them, because the color makes it a bit more playful. Hence, product designs can help people to feel connected to people they feel affiliated with (‘my type of people’) or to feel autonomous from that same group of people. Prior empirical work showed that people can indeed feel connected or autonomous through product designs (Blijlevens & Hekkert, 2013). Moreover, both connectedness and autonomy positively influence aesthetic pleasure for product designs. In order to be able to provide an explanation for these relationships we adopt an evolutionary psychological perspective to aesthetic pleasure.

Evolutionary view on aesthetic pleasure
From an evolutionary psychological perspective, aesthetic pleasure directs beneficial behavior for people’s survival (Tooby & Cosmides, 2001; Johnston, 2003; Lindgaard & Whitfield, 2004). More specifically, it is argued that people’s behavior is modulated by aesthetic pleasure through reward systems in the brain that are activated with behavior that is positive for people’s survival (Grinde, 1996; Lindgaard & Whitfield, 2004), which motivates people to conduct such behavior. Previous research has theorized that basic evolutionary needs, such as the needs for safety and accomplishment, still direct people’s behavior today (Griskevicius & Kenrick, 2013) and explain aesthetic pleasure derived from objects of today’s world, including product designs, art and other manmade objects (Hekkert, 2006; Hekkert, 2014). Both relatively opposite goal driven safety seeking behaviors and accomplishment seeking behaviors are marked by pleasurable feelings, because they are beneficial for the survival of the human species. Hence, it is argued that product designs that help optimize safety and accomplishment are the most aesthetically pleasing.
Safety/risk and connectedness and autonomy

People have evolved into social human beings and thus need to survive within this social world (Tooby and Cosmides, 1992). We, therefore, expect that the evolutionary needs for safety and accomplishment are at play on a social level as well. Accordingly, it can be argued the need for safety is, on a social level, fulfilled through fulfilling the need for connectedness and the need for accomplishment is, on a social level, fulfilled through fulfilling the need for autonomy. Consequently, as previous research showed, product designs that fulfill the need for connectedness are aesthetically pleasing while product designs that fulfill the need for autonomy are aesthetically pleasing as well (Blijlevens & Hekkert, 2013). If the basic needs for safety and accomplishment indeed explain the relationships of connectedness and autonomy with aesthetic pleasure for designs then conditions of safety versus accomplishment should influence the relative importance of connectedness and autonomy in explaining aesthetic pleasure. In two studies we set out to assess whether safety versus accomplishment moderates the relationships of connectedness and autonomy with aesthetic pleasure. In the first study we assessed the effect of Regulatory Focus while in the second study we manipulated feeling of safety/risk.

Study 1

Regulatory Focus Fit (Higgins, 1997) is experienced when there is a fit between someone’s goal and the means with which someone approaches his/her goal. Some people are more prevention focused and goals thus focus on safety and responsibilities, while other people are more promotion focused and their goals focus more on hopes and accomplishments. When the approach to attain the goals fits with the type of goals, it is marked by a positive experience, which may then be attributed to the approach itself (Avnet & Higgins, 2003). People (sometimes depending on situations) are either prevention or promotion focused. We argue that when it is someone’s goal to attain safety, and a product design makes him/her connected, there is a match in goal and approach, which is then marked by a positive experience that is attributed to the product design and thus leads to positive aesthetic pleasure for the product design. Similarly, when it is someone’s goal to attain hopes and accomplishments, and a product design makes them feel autonomous, there is a match in goal and approach, which then ultimately leads to positive aesthetic appreciation for the product design. Hence, we expect that for people with a prevention focus connectedness influences aesthetic pleasure more and autonomy influences aesthetic pleasure less than for people with a promotion focus.

Method

Participants

Students of the Automotive Design minor at the faculty of Industrial Design Engineering (Delft University of Technology, The Netherlands) participated in this study (N = 33, mean age = 23.04, SD = 1.34, 22 male).

Stimuli

We chose to use product designs from the product category sneakers, because they have social relevance. Nine product designs were chosen that together represented the broad range of product designs that are currently found within the market and thus varied on many physical design aspects, such as color, shape and materials used.

Procedure

First, participants rated product designs on aesthetic pleasure with the items: “this is an attractive [sneaker]”, “this [sneaker] is pleasing to see”, and “I like to look at this [sneaker]”.

Before participants were asked to rate product designs on connectedness and autonomy, participants received the following explanation to assure they rate the product designs on connectedness and autonomy with reference to the group of people they feel affiliated with (“type of people”):

“You will be asked to rate product designs on what they mean to you in relation to your ‘type of people’. With your ‘type of people’, we refer to the people to whom you reflect yourself and that you compare yourself with. They are more or less like you and you feel a good fit with them. Sometimes they are easily defined (e.g., businessmen, students), but often you can’t. However, you do probably have a clear idea of who your type of people are. When answering the following questions please keep your type of people in mind. Please, take some time to think of who your type of people are.”

Connectedness is measured with: “This product design makes me feel connected to my type of people”, “This product design shows that I take the opinions into account of my type of people” and “This product design shows that I am similar to my type of people”. Autonomy is measured with the items: “This product design helps to emphasize my individuality towards my type of people”, “This product design helps to distinguish myself from my type of people” and “This product design communicates to my type of people that I do my own thing”.

Functionality was measured to statistically correct for confounds. The items to measure functionality were: “this product design is functional”, “this product design is easy to use”, “this product design is user-friendly”. Finally, participants were asked to fill in a questionnaire measuring Chronic Regulatory Focus by Summerville and Roese (2008).

Results

General Least Squares hierarchical regression model was fitted on aesthetic pleasure as dependent variable with the independent variables connectedness and autonomy and the covariate functionality in step one and dummy variable Regulatory Focus (constructed from difference scores; 0 = prevention focus and 1 = promotion focus) and all interaction terms as independent variables in step two. The second
regression model showed a significant change in $\Delta R^2 (\Delta R^2 = .014, p < .05)$. As expected, the results revealed that both connectedness and autonomy positively influenced aesthetic pleasure for product designs. Moreover, regulatory focus and connectedness showed a significant interaction effect on aesthetic pleasure ($R^2 = .61, F(6,245) = 63.477, \beta_{\text{connectedness}} = .811, p < .01, \beta_{\text{autonomy}} = .150, p < .05, \beta_{\text{functionality}} = .136, p < 0.01, \beta_{\text{RF}} = .01, \text{ns}, \beta_{\text{connectednessXRF}} = -.152, p < .01, \beta_{\text{autonomyXRF}} = .001, \text{ns}$). As expected, connectedness had a larger effect on aesthetic pleasure for people with a prevention focus, $\beta_{\text{connectedness}} = .815 p < .001, \beta_{\text{autonomy}} = .137 p < .01; \beta_{\text{functionality}} = .138 p < .05$ than for people with a promotion focus ($\beta_{\text{connectedness}} = .572, p < .001; \beta_{\text{autonomy}} = .163 p < .05, \beta_{\text{functionality}} = .136, \text{ns}$).

We were able to replicate the effect that connectedness and autonomy positively influence aesthetic pleasure. Moreover, we found that the effect of connectedness is moderated by regulatory focus. When people are prevention focused, connectedness influences aesthetic pleasure more than for people who are promotion focused.

**Study 2**

In this study, we decided to manipulate risk to provide additional proof that safety/achievement moderates the effect of connectedness and autonomy on aesthetic pleasure. We manipulated level of risk through creating conditions of either safety or risk. In the risky condition, participants were told that their ratings of product designs would be shared with other participants, that the product designs would actually be introduced to the market based on their ratings, and that they would have to justify their ratings afterwards. In the safe condition, the questionnaire contained the TU Delft logo and colors and anonymity of participation and participation ‘for research only’ purposes were emphasized in the instruction of the questionnaire. They were also told that they would be asked to answer some general questions in essay form after rating of backpacks, in order to keep anticipated workload the same across conditions. After this instruction, participants were asked to rate the backpacks on aesthetic pleasure with the same items as used in Study 1. To reduce confound effects the participants also rated the backpacks on functionality with the same items as used in Study 1.

**Results**

General Least Squares hierarchical regression model was fitted on aesthetic pleasure as dependent variable with the independent variables connectedness and autonomy and the covariate functionality in step one and dummy variable Risk (0 = safe and 1 = risk) and all interaction terms as independent variables in step two. The second regression model showed a significant change in $\Delta R^2 (\Delta R^2 = .003, p < .05)$. As expected, the results revealed that both connectedness and autonomy positively influenced aesthetic pleasure for product designs Moreover, risk and autonomy showed a significant interaction effect on aesthetic pleasure ($R^2 = .536, F(6,1199) = 229.51, \beta_{\text{connectedness}} = .191, p < .01, \beta_{\text{autonomy}} = .300, p < .01, \beta_{\text{functionality}} = .496, p < .01, \beta_{\text{RF}} = -.013, \text{ns}, \beta_{\text{connectednessXRF}} = .02, \text{ns}, \beta_{\text{autonomyXRF}} = -.094, p < .01$). As expected, autonomy had a larger effect on aesthetic pleasure for people in the safe condition ($\beta_{\text{connectedness}} = .206 p < .001, \beta_{\text{autonomy}} = .282 p < .01; \beta_{\text{functionality}} = .417 p < .05$) than for people in the risky condition ($\beta_{\text{connectedness}} = .204, p < .001; \beta_{\text{autonomy}} = .179, p < .01, \beta_{\text{functionality}} = .573, p < .01$).

Again, we were able to replicate the effects that connectedness and autonomy positively influence aesthetic pleasure. Moreover, we found that the effect of autonomy is moderated by risk. When people were in the safe condition, autonomy influences aesthetic pleasure more than for people who are in the risky condition.

**General Discussion**

In this research, we set out to show that the evolutionary needs for safety and accomplishment explain the positive effects that connectedness and autonomy have on aesthetic pleasure for product designs. We managed to replicate the
prior findings (Blijlevens & Hekkert, 2013) that connectedness and autonomy both positively influence aesthetic pleasure for product designs. Because we argue that these relationships are the result of fulfilling basic evolutionary needs for safety and accomplishment, we set out to assess whether safety and accomplishment moderate these relationships. As expected, in Study 1, we showed that people who are prevention focused appreciate connectedness more than people who are promotion focused. In study 2, we found that people in a safe condition prefer autonomy more than people in a risk condition. Hence, we can conclude that, indeed, product designs can fulfill the needs of safety and accomplishment on a social level by feeling connected and autonomous, respectively, through product designs, which consequently leads to positive aesthetic pleasure for those designs.

In Study 1, regulatory focus did not influence the effect of autonomy on aesthetic pleasure, while in Study 2, the risk manipulation did not influence the effect of connectedness on aesthetic pleasure. An explanation can be that the product categories themselves have a certain level of social risk (there are differences between categories in the level to which people find others’ opinions on the design chosen within the category important) that influenced the relationships of connectedness and autonomy with aesthetic pleasure, which consequently mitigated the effect of the moderator. In previous research, we found differences in the influence of autonomy and connectedness between product categories that differ in social risk. It can be argued that, because sneakers (or shoes in general) are relatively socially risky, there is a higher overall need to fulfill the need for connectedness than autonomy (indeed the overall beta of autonomy was very low) and therefore an interaction effect with regulatory focus was only shown with connectedness. Similarly, backpacks are less socially risky and therefore people feel safe and are more motivated to express their autonomy rather than their connectedness and therefore an interaction effect of risk was only shown with autonomy. In future research this could be further explored.

This research does not only provide fundamental insights in how product design’s social function influences aesthetic pleasure, but also provides designers with guidelines on how they can use product designs’ social functions to create product designs that are aesthetically pleasing.

Acknowledgments

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The Development of a Reliable and Valid Scale to Measure Aesthetic Pleasure in Design

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Abstract

There is a lack of consistency regarding the scales used to measure aesthetic pleasure. They are often chosen ad hoc or derived from other research fields but never validated for design. Moreover, those scales often do not measure aesthetic pleasure in isolation, but instead include its determinants (e.g., novelty). Therefore, we developed a scale to measure aesthetic pleasure. We also included scales to measure determinants known to influence aesthetic pleasure for discriminant validity purposes. In the exploratory phase, we identified highly reliable items representative of aesthetic pleasure and its determinants across product categories. In the validation phase, we confirmed these findings across different countries (Australia, Netherlands). Apart from the theoretical contribution, this research has practical implications for guiding designers.

Keywords: Aesthetic pleasure, Design, Scale development. Determinants of aesthetic pleasure

Introduction

Research on aesthetic pleasure derived from designed artifacts has stimulated increasing interest in the design, marketing and psychology literature (e.g., Veryzer & Hutchinson, 1998; Hekkert, 2006, 2014; Leder, Belke, Oeberst, Augustin, 2004; Hoyer & Stokburger-Sauer, 2011; Blijlevens, Carbon, Mugge & Schoormans, 2012). It is known that people’s aesthetic pleasure derived from designs depends on the presence of certain design properties in the design (e.g., typicality, symmetry, simplicity). However, the findings regarding how design properties influence aesthetic pleasure in design are often contradictory. For example, some research showed that people have a preference-for-prototypes (Whitfield & Slatter, 1979), while other research showed that people are also drawn to novel designs (Schoormans & Robben, 1997; Hekkert, Snelders & Van Wieringen, 2003; Lindgaard & Whitfield, 2004, Moshagen & Thielisch, 2010; Blijlevens, et al, 2012). We believe that such contradictory findings are partly due to a lack of consistency among the scales used to measure aesthetic pleasure. Up until now, no research has been conducted to develop a reliable, valid and generalizable scale to measure aesthetic pleasure in design. Scales used in the literature are often chosen ad hoc or are derived from other fields of research (e.g., art, Human-Computer Interaction), however those scales have never been validated for usage in design. In addition, those scales often do not measure aesthetic pleasure in isolated form, but include constructs known to influence aesthetic pleasure, its determinants (e.g., typicality, symmetry) (see for example Augustin, Carbon & Wagemans, 2012; Hassenzahl, Burmester, & Koller, 2003). These scales can be used to assess whether a certain given design or object is expected to be aesthetically pleasing, because we have general knowledge of what makes something aesthetically pleasing. However, we lack a reliable and valid scale to measure aesthetic pleasure in design if the goal is to build constructive theory on what factors influence aesthetic pleasure and how it is that they do. Therefore, we contribute by developing a reliable, validated and generalizable scale to measure aesthetic pleasure in design.

Theoretical Framework

Aesthetic Pleasure

Traditionally, research within the domain of aesthetics has been directed primarily towards artworks; however, any object can be aesthetically appreciated, and objects are often deliberately designed to induce aesthetic pleasure (Postrel, 2003). Despite this, uncertainties exist regarding the concept of ‘aesthetic pleasure’. In fact, the question of what denotes aesthetic pleasure has been the subject of debate over the past centuries. Three main viewpoints can be distinguished: objectivist, subjectivist, and interactionist. Some believe that aesthetic pleasure is based on inherent properties of an object itself that causes pleasure in the perceiver (objectivist view). According to this view, there are critical features that contribute to aesthetic pleasure, including symmetry, balance, proportion, complexity, and so on (Moshagen & Thielisch,
2010; Reber, Schwartz, & Winkielman, 2004). The subjectivist view proposes that an object is aesthetically pleasing if it gratifies the senses. Accordingly, beauty is a function of the qualities of the perceiver – thus, this viewpoint has led to statements such as: “beauty is in the eye of the beholder” (Moshagen & Thielsch, 2010; Reber et al., 2004). The modern-day, interactionist interpretation, and the one that we will adopt in this research, is that aesthetic pleasure is a function of both the objective properties of an object, and the characteristics of the perceiver – that is, aesthetic pleasure is a consequence of how perceivers and objects relate. According to this viewpoint, aesthetic pleasure is value positive, intrinsic, and objectified. It is considered positive because it provides pleasure. It is intrinsic in that objects are perceived without any reasoning about utility. That is, aesthetic pleasure is said to occur immediately upon first sight as opposed to after long lasting cognitive processing. And lastly, it is objectified because people experience aesthetic pleasure as something that is evoked by the object, rather than being exclusively a positive sensation of the body (Moshagen & Thielsch, 2010; Reber et al., 2004).

**Determinants of Aesthetic Pleasure**

Historically, much research has been conducted to define determinants of aesthetic pleasure. These can be roughly divided into two categories: perceptual and cognitive determinants. The perceptual determinants include symmetry, simplicity, harmony, proportion, balance, unity, and variety (Berlyne, 1971; Fechner, 1876; Hekkert, 2006; 2014; Post, Blijlevens & Hekkert, 2013). Perceptual determinants like symmetry, unity and simplicity aid in processing the object as a whole, and this fluent processing is marked by pleasurable feelings (Reber, Schwarz & Winkielman, 2004; Hekkert & Leder, 2007; Hekkert, 2006). Determinants like variety and complexity make a design more interesting and, therefore, more aesthetically pleasing (Berlyne, 1971; Hekkert & Leder, 2007; Hekkert, 2006). The relationships between perceptual determinants with aesthetic pleasure have mostly been empirically tested for art and artificial stimuli such as polygons, and have only recently gained interest in design (Post, et al, 2013). Cognitive determinants of aesthetic pleasure have been more thoroughly tested within design, but have mainly focused on the relationships of typicality and novelty with aesthetic pleasure. As for these cognitive determinants, people often prefer typical designs, because they are easily recognizable and therefore meaningful (Whitfield & Slatter, 1979; Veryzer & Hutchinson, 1981; Hekkert & Leder, 2007). On the other hand, research has shown that people are also drawn to novel designs (Schoormans & Robben, 1997; Hekkert, Snelders & Van Wieringen, 2003; Blijlevens, Carbon, Mugge & Schoormans, 2012). Even though it is pleasurable to understand something within the first instance, we also have a need to learn new things and ‘solving a puzzle’ is rewarding and therefore pleasurable (Venkatesan, 1973; Armstrong & Detweiler-Bedell, 2008). Therefore, a design that is more novel than what people are often exposed to in daily life can also provide aesthetic pleasure. Several researchers have tried to reconcile these seemingly opposing findings by empirically testing long known design principles such as ‘unity in variety’ (Fechner, 1876; Berlyne, 1971) and Most Advanced, Yet Acceptable (Loewy, 1951; Hekkert et al., 2003). When trying to understand aesthetic pleasure in design such research is very important. However, as indicated previously, between studies, aesthetic pleasure is measured in different ways. Thus, the findings are not always comparable, making it difficult to draw strong conclusions regarding the relationships between these determinants and aesthetic pleasure.

**Measuring Aesthetic Pleasure**

Many of the scales used in the literature to measure aesthetic pleasure are chosen ad hoc or were chosen based on previous studies of aesthetic pleasure, which were not empirically tested to determine whether they do actually reliably and validly measure aesthetic pleasure. For example, many researchers refer back to Page and Herr (2002) who used attractive as an item to measure aesthetic pleasure. Others opt for multiple item measures and include items such as beautiful, pleasing and liking. In those cases, often no references to articles from which the items were taken are included. Within the field of design no reliable and valid measures exist to assess aesthetic pleasure derived from designs. In other fields of research, scales do exist that measure aesthetic pleasure. For example, in Human-Computer Interaction (HCI), the scale AttrakDiff was developed and is now widely used (Hassenzahl & Monk, 2010). This scale measures pragmatic value, hedonic value, beauty and goodness. In particular, the hedonic value is described to assess aesthetic pleasure. Items that assess the hedonic value include captivating, stylish, premium and creative. In the field of art a scale to measure aesthetic pleasure for artworks is currently being developed that includes items such as beautiful, incomprehensible, fascinating, ordinary, original, innovative, attractive, happy, warm and overwhelming (Augustin, Carbon & Wagemans, 2012). The aforementioned scales have not been validated in design and thus generalizability cannot always be assumed. Designs also serve utilitarian and symbolic purposes and are not purchased for aesthetic pleasure alone (Creusen & Schoormans, 2005). Accordingly, designs are evaluated with partly different goals in mind than artificial stimuli, which may influence the effect of different physical properties on aesthetic pleasure derived from a design (Armstrong & Detweiler-Bedell, 2008). Next to that, in these existing scales items are included that measure determinants of aesthetic pleasure and not aesthetic pleasure as a singular construct. For example, innovative, original and ordinary are items used in scales developed to measure aesthetic pleasure, but, at the same time, these items are used to measure the determinants of novelty and typicality in research assessing the effects of these factors on aesthetic pleasure (e.g., Hekkert et al., 2003). In this research, the goal is to provide a reliable, valid and generalizable scale to help constructive theory building
regarding the factors that influence aesthetic pleasure and the role that it plays within design. In order to be able to contribute to constructive theory building on aesthetic pleasure in design, a scale must be created that is independent, but of course related to, the determinants of aesthetic pleasure in design.

The Current Research

In this research, we assure generalizability by constructing the scale while using different product categories and within those product categories including several designs that together represent the wide variety of designs possible within that product category. Reliability is mainly tested in the Exploratory Phase: exploring the complete factor model and all factors separately. In addition, comparisons of factor structures between product categories and a re-test reliability study were performed. Factor model validation was performed in the Validation Phase: Confirmatory Factor Analysis was performed using Structural Equation Modeling (SEM), wherein the resulting factor model from the Exploratory Phase was now tested on new samples of respondents taken from two different countries (Australia, the Netherlands) and including stimuli from a new set of product categories than those used in the Exploratory phase. In addition, to assess convergent validity in the Exploratory and Validation phases, next to items to measure aesthetic pleasure, items intended to measure its determinants typicality, novelty, unity, and variety were included. Even though these constructs are assumed to be related to aesthetic pleasure, we expect them to be separate factors from aesthetic pleasure in an exploratory factor solution.

Item Generation

First phase

Three researchers performed an extensive literature review of all literature discussing, theorizing and empirically researching aesthetic pleasure in the fields of design, arts, HCI, perceptual psychology and consumer psychology. The researchers all made a list of items or descriptions of the construct used in the literature. All these items and descriptions were collected and were then carefully investigated and replicates were removed. This left 86 items to continue with for further analyses.

Second phase

Two researchers familiar with the literature on aesthetics categorized all the items that were written on individual post-its into two categories: ‘aesthetic pleasure’ or ‘determinant of aesthetic pleasure’. In making our decisions, we considered whether the items adequately reflected our construct of interest, aesthetic pleasure, or whether they reflected perceptual or cognitive constructs known to influence aesthetic pleasure. This categorization process resulted in 37 items for aesthetic pleasure and 49 items that were determinants of aesthetic pleasure. Examples of determinants include familiar, novel, understandable, patchy, and fluent to process. The 37 items for aesthetic pleasure were then used as input for a second categorization task wherein the researchers rated the items on their relevance to the concept ‘aesthetic pleasure’ on a scale from 1 to 5 (1 = not at all relevant, 5 = very relevant). When the researchers did not agree, they discussed until they reached a communal decision. The items that received a score of 3 or above were then used as input for the third phase of item generation (23 items).

Third phase

In the form of a web-based questionnaire, a total of seven established researchers in the field of aesthetics rated all items (23) on the level to which they thought these items were representative of the construct aesthetic pleasure. The average scores of each item were then used as input for an extensive discussion between five researchers established in the field of aesthetics. They considered whether the items were all relevant to the construct of aesthetic pleasure, and whether they were also sufficiently different to each other in conceptual meaning so that the full conceptual construct of aesthetic pleasure could be captured. This resulted in the five final items: pleasant, attractive, nice, beautiful, and like. These items were then reworded with the help of two researchers with English as their first language to be relevant for measuring aesthetic pleasure in design. The final items used as input for the exploratory study were: “…this is a beautiful [object (e.g., camera)]”, “…this is an attractive [object]”, “…this [object] is pleasing to see”, “…this [object] is nice to see”, “…I like to look at this [object]”.

Exploratory Phase

Method

Stimuli selection

Four different product categories were chosen as stimuli (cameras, motorcycles, chairs and web designs) to assure that aesthetic pleasure was generalizable across a broad range of product categories. To assure robustness, within each product category five designs were selected to represent the variety of designs found within that product category.

1This item generation procedure was replicated for generating items measuring typicality, novelty, unity and variety. The final items used as input for the exploratory phase of this research were: “... this is a typical [camera]”, “…this is a good example of a [camera]”, “…this is representative of a [camera]”, “… this design is common for a [camera]”, “… this is a standard design”, “… this is characteristic of a [camera]” for typicality, and “... this is a novel [camera]”, “… this design is original”, “… this is a new example of a [camera]” and “… this design is innovative” for novelty, “this is a unified design”, “this is a coherent design”, “the elements of this design belong together”, “this is an orderly design” for unity, and “this design is rich in elements”, “this is a diverse design”, “this design is made of different parts”, and “this design conveys variety” for variety.
Respondents
A total of 157 respondents from a consumer panel participated in this research. Respondents were recruited from a consumer panel instead of a student population for generalizability purposes. Respondents received reward points for participation that can be exchanged for goods in an online shop when enough reward points are saved; a common compensation for respondents from this consumer panel. Of these 157 respondents, respondents’ answers were deleted for people who did not finish the questionnaire and who did not have English as their first language. Finally, the respondents’ answers were checked and all respondents that only answered extreme values (1 or 7), only neutrals (4) or only consecutive responses (e.g., 2,2,2,...,2,2,2) were deleted from the analyses. The final analyses were performed with a total of 108 respondents (mean age = 52, SD = 13, 66 females).

Procedure
Respondents were asked to indicate how much they agreed with statements describing the given designs using 7-point Likert scales (1 = strongly disagree, 7 = strongly agree). Within this research, items for aesthetic pleasure were included as well as items for its determinants typicality, novelty, unity and variety, to assess the discriminant validity of the aesthetic pleasure scale. These determinants were chosen to be deliberately related to, but not the same as, aesthetic pleasure.

Results
All data analyses have been performed with a non-aggregated dataset. Intra-Class correlations between the aesthetic pleasure ratings showed that people did not agree on the level to which they rated designs (ICC = .084, p < .001) and therefore aggregation would diminish a lot of the unique information present in the dataset.

Exploratory Factor Analysis
An Exploratory Factor Analysis with Varimax rotation revealed five separate factors (based on eigenvalues > 1.0). Two items were deleted from the final structure because they did not conceptually fit with the factor they loaded highest upon: “good example of the category” and “diverse”. In the final factor solution, each factor made conceptual sense based on expectations and were named: aesthetic pleasure, typicality, novelty, unity and variety.

Reliability
Cluster analysis showed that all correlations were above .50 and significant so all items were retained. Factor invariance analysis showed no significant differences between product categories for each factor. Chronbach’s alpha’s were .98 for aesthetic pleasure, .873 for novelty, .925 for typicality, .899 for unity, and .828 for variety.

Re-test reliability
To assess re-test reliability, a sub-sample of the previous sample (N = 50) was administered the exact same questionnaire again after a week’s time had passed. All correlations between Time 1 and 2 for each item were above .5 and significant, except for the item “different parts” loading on the construct Variety (.463). Given that that item loads the highest on the factor variety and was not significantly different across the product categories we decided not to exclude it (invariance analysis). All correlations between the factors in Time 1 and Time 2 were significant and for most above .7, (Nunally, 1978), except for unity (.659) and variety (.584). The goal is to create a reliable and valid scale to measure aesthetic pleasure and the focus is not on its determinants; therefore, we accept that re-test reliability is sufficient to enter all five factors and their items into the factor model tested in the validation phase of this research.

Validation Phase

Method
Stimuli selection
For replication purposes, two product categories used in the Exploratory Phase were used as stimuli in the Validation Phase: cameras and chairs. For generalization purposes two new product categories were chosen as stimuli: sunglasses and sanders. We chose these two product categories because we wanted to be able to validate our results from the Exploratory Phase to product categories that differ in symbolic, aesthetic, functional and ergonomic value (Creusen & Schoormans, 2003). Again, within each product category five designs were selected to represent the wide variety of designs found within that product category.

Respondents
Again, respondents from a consumer panel participated in this research. Respondents’ answers were deleted for people who did not finish the questionnaire and who did not have English (for the Australian sample) or Dutch (for the Dutch sample) as their first language. Finally, the respondents’ answers were checked and all respondents that only answered extreme values, only neutrals or only consecutive responses were deleted from the analyses. The final analyses were performed with a total of 400 participants (200 from Australia, mean age = 46, SD = 16, 113 females, and 200 from the Netherlands, mean age = 50, SD = 14, 131 females).

Procedure
Respondents were asked to indicate how much they agreed with statements describing the given designs using 7-point Likert scales (1 = strongly disagree, 7 = strongly agree). In this phase, the items that served as final output from the Exploratory Phase were used as stimuli in the Validation Phase. A balanced design was used wherein respondents rated all designs of all product categories, but were randomly assigned to start with one of the four product categories. For group comparison analyses, only the first block (1 product category) was used for each respondent.
Results

All data analyses have been performed with a covariance matrix used as input in AMOS 16 (Arbuckle, 1995) for Structural Equation Modeling.

Confirmatory Factor Analysis

Structural Equation Modeling was used to assess whether the input model that resulted from the Exploratory Phase was structurally confirmed with the results of the sample from the Validation Phase. In other words, the same factors should underlie the items of the second sample as in the input model based on the sample of the Exploratory Phase. The five-factor model (aesthetic pleasure, typicality, novelty, unity and variety) from the Exploratory Phase was used to test the data obtained in the second part by means of the two-step approach of Structural Equation Modeling described by Anderson and Gerbing (1988).

The output file generated through Structural Equation Modeling performed by AMOS provided fit measures and suggested no modifications to the model were needed and were thus not administered to the tested model. The results validated the five-factor model that resulted from the Exploratory Phase: the goodness of fit measure (GFI) was 0.90; the normed fit index (NFI) was 0.95; and the comparative fit index (CFI) was 0.95. Additionally, the root mean square error of approximation (RMSEA) shows an acceptable fit (0.076) (acceptable: 0.05<RMSEA>0.08; Jais, 2006). All descriptions have statistically significant loadings on their factors that vary between 0.60 and 0.95, which is consistent with the five-factor model taken as input from the Exploratory Phase of the research. The average variance extracted (AVE) for each attribute is higher than 0.50. Composite reliability of the attributes was assessed with the Fornell and Larcker criterion (1981). All attribute reliability measures were high (lowest is 0.79 for variety). As expected, all inter-correlations between aesthetic pleasure and its determinants were positive and significant (all > .31).

The final five-factor model is depicted in Table 1.

Group Comparisons

Preliminary group comparisons show that the five-factor model that was found in the Exploratory Phase of the research and was confirmed in the Validation Phase, fits for both the Dutch and Australian samples (GFI =0.891, AGFI = 0.857, NFI = 0.947, CFI = 0.949, RMSEA = 0.056). For the Australian sample, all regression weights were significant and > .50. For the Dutch sample all regression weights were significant and > .70.

<table>
<thead>
<tr>
<th>Table 1: Factor loadings for the full five-factor model</th>
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<tr>
<td>Aesthetic Pleasure</td>
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<tr>
<td>Like to look</td>
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<td>Nice to see</td>
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<td>Pleasing to see</td>
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<td>Attractive</td>
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<td>Beautiful</td>
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<td>Common</td>
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<td>Typical</td>
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<td>Characteristic</td>
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<td>Innovative</td>
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<td>Conveys variety</td>
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<tr>
<td>Different parts</td>
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<tr>
<td>Rich in elements</td>
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</table>
Discussion
Research within the domain of aesthetics lacks a consistent scale to measure the construct of interest: aesthetic pleasure. Thus, this research set out to develop a reliable, valid and generalizable scale to measure aesthetic pleasure in design. Aesthetic pleasure can be measured with the items: “...this is a beautiful [object (e.g., camera)]”, “…this is an attractive [object]”, “…this object is pleasing to see”, “…this [object] is nice to see”, “…I like to look at this [object]”. These items measure the construct aesthetic pleasure, separate from its determinants. This was our aim, because we wanted to create a scale that measures aesthetic pleasure in design that can be used to further advance theoretical knowledge on design aesthetics through studying which factors determine aesthetic pleasure in design.

Data analyses including group comparisons between different countries (including a Taiwanese sample), and product categories are currently underway. In addition, discriminant validity will be tested using constructs measuring emotions and general usability. It is intended that the development of this scale will enable meaningful comparisons between studies of design aesthetics that will help to elucidate the relationships between aesthetic pleasure and its determinants. Thus, the research also has practical implications for guiding designers in creating aesthetically pleasing designs.

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References


Drawing Energy: Exploring the Aesthetics of the Invisible

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Abstract

What Does Energy Look Like? was a two-part empirical study conducted within a European energy research project, which invited people to visualise (through pen on paper), their ideas, mental models, experiences and notions of energy. What emerged was a collection of over sixty Energy Drawings that presents a diverse and multifaceted picture of this often intangible and amorphous subject; and which suggests a broad and sometimes contrasting range of personal definitions and conceptualisations of energy. In this paper we will discuss our findings from our drawing study. We will consider what they tell us about our samples’ aesthetic perception and judgement of energy, the different responses across the samples; and the nature of the categorisations, characterisations and associations that emerged.

Keywords: Drawing; Energy; Invisibility

Drawing Energy: Exploring the Aesthetics of the Invisible

Introduction

What Does Energy Look Like? was a two-part empirical study conducted within SusLabNWE, a European design and engineering energy research project that is exploring people’s perceptions of, and relationships to, energy in the domestic context. In this paper we will present the drawing study that we conducted to explore participants’ ideas and conceptualizations of energy. We will consider what the images produced tell us about that subject, about our samples’ aesthetic perceptions of it, and we will reflect on the nature of the categorisations, characterisations and associations that emerged.

Project Background

SusLab’s aim is to reduce energy consumption in the home environment and the research, which is taking place across the UK, the Netherlands, Germany and Sweden is structured around a set of ‘Living Labs’ – that is to say homes that are instrumented with sensing technologies- to explore people’s existing behaviours as well as the effect of new interventions on energy use.

At the Royal College of Art our work began with a series of ethnographic interviews with householders across London, where we sought to explore people’s ideas about energy and how it is a part of everyday life. While the principle project focus is on energy as a power source and its environmental impact, the word energy, with at least four official definitions in English (Merriam-Webster, 2014), is a concept that resists easy visualization and is not synonymous with any singular or distinct visual icon; and we therefore expanded the frame of reference for our empirical research to fully encompass all the possible meanings the term holds and explore its significance for our participants.

Describing Energy

We quickly found that people’s personal definitions and associations with energy were in fact much broader than heat or electricity. One participant described energy as a kind of smoke or fog, and suggested it was like God – all around us, intangible, powerful and ethereal. Another person told us that to describe energy to a child they would say it is “[a] force. Something that creates change, or motion, or action.” While another person told us that they work hard to save energy at home, not simply for financial or environmental reasons, but because they believed that valuing resources was all a part of practicing their religion.

From early in the project research we found that people’s mental models (Johnson-Laird, 1983) and notions of energy were very diverse. We also consistently found though, that the invisibility of energy was a significant attribute for everyone we spoke to.

One person said to us:
“I think I worked out that through gas and electricity every year, the average house gets the equivalent of a bit over three tonnes of coal delivered completely silently and without any mess. And go back a hundred years ago and everyone would have a really good quantitative understanding of how much energy they used because they had to physically shovel the stuff. So, that made me stop and think.”

This participant was seeking to understand their own energy use by relating it to an equivalent physical mass, but also by comparing their present day experience to a now distant historical context. What this suggests is that the changes in technology and infrastructure that have removed the physical labour and the visual presence of energy from our homes and daily lives, is also a shift that has made it difficult for people to understand their levels of energy consumption.

**Drawing Energy**

The initial research interviews had revealed that the invisibility of energy was a defining characteristic of it among our participants, and one that might be closely connected to understanding one’s own environmental impact through energy use. To counter the limitations that energy’s invisibility might present, we proposed to undertake a drawing study in order to explore energy in new ways, and to use drawing in order to uncover the perceptions people hold and the associations they make with this immaterial entity.

For this we developed a visual research method, where we asked people to respond, through pen on paper to the question: *What does energy look like?* As Gray et al. (2010) suggest, ‘[w]ords become more challenging to visualise as they become less literal’, and energy, as a form of dynamism, power, force or activity, might be considered ‘an idea that isn’t anchored to an object in reality’ (Brown, 2014). We therefore hypothesized that this method could support us in exploring people’s mental models and aesthetic perceptions of the invisible, of energy, and of the infrastructures or meanings connected to it.

The study was conducted as a participatory research activity firstly in a workshop with academic experts from within the SusLabNWE project partnership in June 2013, then with members of the public visiting a Helen Hamlyn Centre for Design exhibition at the Royal College of Art in September 2013. The first phase of work was conducted in Gothenburg, Sweden with academics from Sweden, Germany the Netherlands and the UK, and the second phase of work was conducted in London, UK. The exhibition was attended by members of the public so these drawings were created by a public sample.

It is important to note that this study was not a study of people’s drawing skills or observational drawing proficiency (Kozbelt and Seeley, 2007). No interviews or surveys were conducted alongside the drawing study, meaning that our analysis is based entirely on the visual records produced. By asking participants to draw the invisible we were instead asking them to take part in a conceptual drawing exercise and as such, the study seeks to privilege the ideas, thought processes, emotions or experiences that the drawings seek to communicate.

From these two phases of the drawing study emerged a collection of over fifty *Energy Drawings*, which presents a diverse, multi-faceted and highly personalised picture of this often intangible and amorphous subject. As John Berger (1972) observed in *Ways of Seeing*, “[i]mages were first made to conjure up the appearances of something that was absent” and in time “…the specific vision of the image-maker was also recognized as part of the record.” With this in mind, drawing the invisible also offered a very human-centered means of investigating the aesthetics of energy.

Many drawings depicted the end points of the power we use. The light bulbs, plug sockets, batteries or wires that fill European homes today. These images speak of end use, of daily interaction, immediate access and an at-our-fingertips kind of power. Time, convenience, connectivity and the domestic are important considerations in these images, as they seem to reference the instantaneous, the on-demand and the moment of connection we have with physical power on a daily basis. Importantly, they also speak of the human scale that the energy system is broken down into. Rather than consider the energy grid, or power stations, for example, they present the visible points of contact people have with the energy system and might address how the people behind these drawings experience energy in their immediate environment.

![Fig. 1. Drawing the products that contain energy.](image)

Quite contrastingly, another theme that emerged was that of nature, by which we mean those drawings that reference plant or animal life, the elements and environmental conditions. There are images of the sun and lightning bolts, one drawing of waves, four trees and two delicate flowers, which collectively seem to represent
the full range of force and power within the natural world. The sun might be seen as the original source of energy, and waves and lightning could represent the powerful forces of nature. In fact, we see lightning bolts seven times throughout the collection, and (at the time of writing) it is also the first image on Wikipedia’s Energy page (2014), so perhaps this particular aesthetic has been adopted into our collective conscious as an icon for energy.

Environmental sociologists Thomas Greider and Lorraine Garkovich (1994), in their work on the cultural meanings of landscapes, asked why a real estate developer, a farmer and a hunter all see different things when they look at an open field. One, they suggest, sees a suburban development, one, rows of wheat, and the last, a grazing deer. It is important to note that to ‘see’ in this context is also described as to ‘envision’, and so suggests imagining, mentally picturing what could be there, rather than what necessarily is. This example therefore presents a different way of working with the invisible and the responses, which do not have to be conditioned by what is real or tangible in the local environment, can express a person’s ambitions or priorities.

Greider and Garkovich argue that the field ‘is the same physical thing, but it carries multiple symbolic meanings that emanate from the values by which people define themselves.’ This would suggest that the significance that the field, or the idea of energy holds for different individuals is representative of the ideas and experiences that are meaningful for them; and that the drawings can be read as a reflection on the image-makers’ personal values.

As Berger (1960) also wrote: ‘[a] drawing is an autobiographical record of one’s discovery of an event – seen, remembered or imagined.’ And so through the act of drawing (perhaps particularly when the subject matter is invisible, as there are no physical cues to respond to) we learn about an individual’s experiences, memory and imagination, in relation to that subject. In Greider and Garkovich’s terms, what we see on the page is a ‘symbolic transformation’ and ‘a sociocultural phenomenon’, not a physical one.

In the context of this study this suggests that the aesthetics of the invisible can be closely linked to personal history, that the freedom to interpret and to give form to an intangible and somewhat abstract idea can be a blank canvas and an opportunity through which people are able to express their thoughts, memories or ambitions. And this naturally also suggests that the aesthetics of the invisible are diverse. This last point is of course strongly supported by our empirical evidence. The drawings address a wide array of conceptions and notions of energy, which combine to define it as a layered and versatile entity.

Many of the images in the drawing study are abstract. They are very concerned with color and form but do not suggest, in the way those discussed earlier do, an explicit connection to, or association with, the objects around us. In this way perhaps these images seek to visualise the matter of energy itself, to materialise the invisible, rather than depict those other physical entities that either embody energy or allow us access to it.
Even in this range of images though, we see diversity. One drawing from the exhibition part of the study shows a single and simple horizontal line – an isolated element on which to focus our attention. While another, from the same group of participants, depicts a knotted, frenzied and chaotic mix of lines of different colours and trajectories.

Another set of images appropriates symbols, or illustrates dynamic systems to address the behaviours or properties of energy. One image, again from the exhibition group shows the mathematic infinity symbol, another from the SusLab project partnership shows the transformation of energy from one kind to another (Fig. 4), while a third, also from this group details how energy ‘cannot be lost’. Flows, then, are present across the sample groups and perhaps surprisingly, there is little to differentiate the collective responses of one group of participants from the other. Fig. 4, which is the only non-pictorial systems diagram in the collection possibly draws on prior technical knowledge, as might an image of a water tower and its connecting pipes, but the other responses from the SusLab project partnership appear to draw on personal experience as much as those of the public sample.

Considering the collection as a whole, it is noticeable that many of the drawings convey an optimistic, enthusiastic or environmentally conscious tone – whether they were created by an expert in energy or not, an adult or a child. Two pieces from the collection are drawings of hearts, one beating. Several depict the globe, and one the entire Universe. One shows a sun with a smiley face, while another – an entirely written response – includes the statement: ‘WITHOUT ENERGY LIFE BECOMES MISERABLE’. Next to a drawing of a light bulb another reads: ‘Energy is light, an idea, excitement, positivity’ (Fig. 1), a lightning bolt is annotated with the word ‘FREE’ and an illustration of a magician with a wand is accompanied by the phrase: ‘ENERGY IS MAGIC’.

Across both sample groups then, we see evidence of a positive approach to the idea of energy, and in the context of Greider and Garkovich’s work on envisioning and self-definition, and Berger’s discussion of drawing as an autobiographical record, it is possible to think of the interpretations we find within the drawing collection as an act of envisioning or recalling positive and personalized scenarios or relationships to energy.

What Is Not Drawn

To continue this line of enquiry, it is also interesting to note that where sources of energy are depicted, we find that the illustrations are almost unanimously of renewable energy. Alongside the drawings of the sun and waves already discussed, we see images of wind turbines on eight occasions, and from the exhibition group we find a new proposal for harvesting rainwater. Electricity pylons, which are a common feature of the British landscape, and a much longer-standing and established infrastructure than wind turbines - the first pylon was erected in 1928 (National Grid, 2014) and the first wind turbine in 1991 (Nixon, 2008) - only feature once.
The prevalence of renewable energy in the drawings is also intriguing when we consider that it remains a minority energy source across Europe. In the UK (where one of the two samples was conducted) renewable energy accounted for 15.5% of the total electricity generated in Q2 of 2013, which was an increase from 9.7% in the previous year, but coal, gas, oil and nuclear comprised 82.9% of electricity generated (Department for Energy and Climate Change, 2013). The energy mix in Europe is changing, and has fluctuated over recent decades. Oil consumption in the UK fell from over 13 million tonnes in 1970 to 780,000 tonnes in 2012, (Anderson, 2013) and across Europe renewables are forecast to account for 16% of total residential energy use by 2020 (E3M-Lab 2013). The role of renewables in our energy mix is growing, but it is still heavily dominated by fossil fuels, yet they are scarcely represented in the images, which might suggest that the drawings present acts of envisioning what might be and look to the future, rather than present what is at present, or has been in the past.

Nor is the fierce political debate and media coverage about the increasing costs of energy in the UK present in the images. The UK Energy Research Centre found that media coverage of the costs of energy for householders was 'substantial', and that energy was an important part of the political agenda. Between 2012 and 2013 the average UK household expenditure on electricity increased by 6.5%. The cost of fuel and heating homes is increasingly difficult for many families, and it is the subject of much public debate, yet these worries or unsettling realities are not represented in the images.

Another interesting omission from the drawings is numbers. When we talk about energy, in terms of what we use and how much if costs, we quantify it. We seek to measure it, or at least energy suppliers communicate to their customers in measurements. But apart from two examples from the SusLabNWE group – one that shows the price of energy, and another that shows the temperature on a thermostat - the drawings do not portray numbers, and we therefore do not find a link between numbers or metrics and the ideas that most of the participants want to convey about energy. This finding can lead us to ask whether quantifying energy is in fact a valuable means of communicating to the public, and whether other modes of communication or explanation might be more effective in engaging people in a dialogue about energy consumption.

There may be many reasons for omitting these realities of engaging with energy in day-to-day life. Some of the images of course deal with energy other than the power source: emotional energy, for example, or biological energy. Others, in dealing with the abstract nature of energy, as a flow or a system, as we have already seen, address the properties or behaviours of energy outside of human interactions with it; and of course the daily realities of fossil fuel production, political debate and bills are very much human concerns.

The drawings that do overtly address the human relationship to energy however seem almost unanimously to frame energy in positive terms. This could in itself be a decidedly political stance. Far from avoiding the politics of energy supplies that are a reality of Europe today, in these drawings that present clean energy and ignore the metric scales that govern the energy market the image-makers could in fact have taken a deliberate political choice, one in which they have elected to draw the politics of the desirable, rather than the real.

Limitations

Whether politically motivated or not, it is important to acknowledge that the emphasis on emerging sources of energy could be in part due to a bias of the research method: Both studies were conducted in a design exhibition or workshop environment – contexts in which participants were encouraged to explore and create, and which value the development of new ideas. It is possible then, that these conditions encouraged participants to form and express new visions of what energy could be, or what they would like or expect to see in future, rather than their experienced realities.

Conclusions

What people have drawn in terms of technology at least, leans towards the future rather than towards the historic, but in other ways the results are more divergent. We find that across the sample the definitions of energy are diverse. It’s aesthetics link to personal history and emotions, but also to infrastructure and systems. It stretches across scales, and from the human and engineered, to the natural and untouched; and it concerns the political, the aspirational and the unique, as well as the ubiquitous and the everyday.

To draw on one final example I would like to turn to a public art project created in London in 1993. Rachel Whiteread’s House, was a full-scale concrete cast of the last of a row of Victorian houses to be demolished. The sculpture stood alone in derelict land before it too, was eventually pulled down. House provoked a very strong public response: Local residents, newspapers, politicians and arts groups all voiced differing opinions. James Lingwood (1995), one of the piece’s commissioners later wrote of House and the public reaction to it that ‘it was by no means clear what values it sought to promote. It did not seek to predetermine the ways in which people could respond to it.’ He also wrote though, that it was ‘able to absorb into its body all those individual thoughts, feelings and memories projected onto it.’

House provoked diverse public opinion relating to the treatment and fabric of the local environment; and connected to individual experience and memory. It became an entity in which many people had a stake, and it is possible to see too, how energy is similarly a shared
part of the local environment, in which all individuals and groups have a vested interest. We can then see the diversity in the collection of drawings as a collection of distinct voices, expressing personal experience and differing relationships.

The aesthetics of energy are of course very subjective. But in presenting these varied and sometimes opposing views of energy, we think this study has reflected on some of the enormous complexities in what we often experience as simple daily realities. What has been produced is a diversity of representation, and through the associations and interpretations presented, we think that this collection of drawings presents an exploration of how the subject of energy is culturally constructed.

Acknowledgments
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Art Experience in the Museum

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Abstract

While a museum is a context where art is commonly appreciated, the laboratory is the context where empirical aesthetic research is commonly conducted. We compared aesthetic experiences and viewing behavior in the museum and laboratory to examine the effect of context on art experience. In a series of studies, participants viewed artworks in the museum and/or the laboratory while aesthetic experience and viewing behavior were measured via self-reports and mobile eye tracking. Our results show that art in the museum is liked more, found more interesting, positive, and interesting, and it is remembered better than in the laboratory. Art experience was related with viewing time, and this relation was modulated by context.

Keywords: art; aesthetic experience; memory; context; museum; mobile eye tracking

Introduction

Empirical research on the experience of art has been mainly conducted in laboratories. Such research has expanded our knowledge about the psychological processes involved in art appreciation by enabling the study of aesthetic experiences with control and rigor. Thus, although the laboratory is a common context for psychological research on art, the museum context is a common context for encountering art. Art museums are environments especially designed for a focused, reflective, and multi-sensory experience. They highlight the objects’ artistic status and foster the adoption of an aesthetic orientation (O’Doherty, 2000). Do differences between the laboratory and museum contexts lead to differences in how people experience and behave towards art? In a series of studies, we addressed this question by using different measurement techniques and research designs.

Method

In the first study (Brieber, Nadal, & Leder, 2014), participants took part in two sessions in which they viewed and evaluated original artworks in the museum and reproductions in the laboratory. In both sessions, participants were asked to report their experience for each artwork on liking, interest, arousal, valence, and understanding scales. Additionally, in session two, participants’ memory for artworks was measured.

Results and Discussion

Our results from study 1 showed that art experience is enhanced in the museum. Compared to the laboratory, people in the museum liked artworks more, found them more interesting, and felt more affectively positive and aroused. Thus, in line with other studies (Locher, Smith, & Smith, 2001, 1999), artworks viewed in the museum seem to elicit increased affect-related experiences than their reproductions in the laboratory. In addition to this enhanced art experience, people in the museum remembered almost twice as many artworks as people in the laboratory. This superior free recall performance was related to participants’ use of the spatial layout of the museum as a recall strategy.

Replicating this museum enhancement effect with a between-subjects design, study 2 found higher art appreciation in the museum than in the laboratory. Thus, people viewing artworks in the museum liked them more and found them more interesting than people who viewed them in the laboratory. On the other hand, the museum and laboratory group did not differ with regards to their evaluation of ambiguity or their feeling of understanding the artworks.

These differences in art experience between contexts were also accompanied by differences in viewing behavior. By using mobile eye tracking in the museum, we were able to...
differentiate between viewing time for artworks and labels. While viewing time for labels did differ between groups, viewing time for artworks did. On average, people in the museum ($Mdn = 38$ s) spent more time viewing art than people in the laboratory ($Mdn = 28$ s). Although these average viewing times are in the range of viewing times reported before (Heidenreich & Turano, 2011; Smith & Smith, 2001), differences between studies are probably due to differences in the size of the exhibition or the number of artworks seen before viewing the artworks under investigation.

In contrast to other studies measuring viewing time and art experience in the museum (Heidenreich & Turano, 2011), we could show that, in both contexts, viewing time was positively related with art appreciation and understanding: the more people appreciated and understood an artwork, the longer they looked at it. Moreover, the effect of art appreciation and ambiguity on viewing time was modulated by context. In the museum, more ambiguous artworks lead to longer viewing times, whereas in the laboratory, more ambiguous artworks lead to shorter viewing times. Additionally, art appreciation tended to be a better predictor for viewing time in the laboratory than in the museum.

Our research demonstrates that there is a difference between the museum and the laboratory in how people enjoy and approach art. It supports prior research by showing that aesthetic experience is sensitive to context, especially its affective aspect. However, a preliminary analysis of the data from study 3 suggests that there are certain limitations to this effect, which may be associated with the beholder’s level of art expertise, the style of artworks, and the narrative structure of the art exhibition. The mechanisms underlying this museum enhancement effect and its generalizability, however, are still unclear. Several characteristics of art museums, such as physical context (O’Doherty, 2000), authenticity (Newman & Bloom, 2012), or artwork size (Clarke, Shortess, & Richter, 1984) might contribute to this effect.

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References
Abstract

In the post-war era and especially after the documenta II in 1959, abstract art was claimed to be a “world language”, universally comprehensible, independent of cultural, historical or political contexts. If these assumptions were true, abstract art should elicit a more universal perception- and evaluation-process compared to representational art. To test this hypothesis empirically, we conducted an eye-tracking study and tested 38 participants (Brinkmann et al. 2014). In a second experiment with the same study-design but different stimuli another 40 participants were recorded. Additionally to the eye-movements information on their cognitive and emotional evaluations was collected. Our results suggest that the concept of abstract art as a universal language was not confirmed and needs to be revised.

Keywords: Abstract Art; Empirical Aesthetics; Eye-Tracking

Method

In both of our experiments a set of five abstract and five representational artworks was shown on a high resolution screen. The artists of the selected paintings were all part of the documenta in 1959. After beholding each painting, participants were asked to use a 7-point scale semantic differential (13 bipolar adjectives, e.g. active – passive, friendly – unfriendly, etc.) to indicate their cognitive and emotional evaluation of each artwork. While perceiving the artworks (for two minutes each), we recorded the eye-movements of the participants (N=38 in the first and N=40 in the second experiment), using a binocular remote eye-tracker (SMI Red 120). The second experiment was conducted in order to ensure the reproducibility of our results. We analyzed the data by running two separate mixed linear models with random intercepts and random slopes for image characteristics (intensity of color, number of depicted elements, presence of depicted humans, abstraction as dichotomous variable). The first model addressed the question whether there are differences in individual attention profiles of participants concerning abstract and representational artworks and the second one addressed the collective distribution of attention by

Seeking for a Universal Visual Language
The Perception of Abstract Art - Claim and Reality

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Introduction

Particularly after World War II abstract art became popular in the western world as a symbol of freedom and democracy opposed to social realism. Abstract forms were connected to a universal language that overcame national borders and was to be understood by everyone. In 1959 the art historian Werner Haftmann introduced the general public at the documenta II in Kassel with the concept of abstract art as a “world language”. This opinion was not only shared by art historians from Clement Greenberg (1986) until today (Brüderlin 2001, Rosenthal 1996), but also by artists like Willi Baumeister, Robert Motherwell, Jackson Pollock and Barnett Newman, who called the artists to free themselves “of the impediments of memory, association, nostalgia, legend, myth, or what have been the devices of Western European painting” (1947, 173). Vice versa this meant that not only the production but also the reception of abstract paintings has to be different from representational works of art: „The image we produce is the self-evident one of revelation, real and concrete, that can be understood by anyone who will look at it without the nostalgic glasses of history” (Newman 1947, 173). The intention of these artists was to promote an unprejudiced and nonbiased way of beholding paintings through the pure value of forms and colors as such. This led to an increasing importance of the “act of viewing art” itself and to the question: Could abstract art be understood on a visual level in a universal way?

In collaboration between art-historians and psychologists we conducted an empirical eye-tracking study to find answers to this question. If abstract art can be interpreted as an art that elicits a more universal experience compared to representational art, this should be reflected in a more homogeneous perception- and evaluation-process.
modelling the number of fixations located in shared regions of interest.

**Results**

In both of our experiments we found that participants rated highly consistent in the semantic differential. The different paintings obviously do have different qualities and people agreed strongly in items, which describe these essential qualities of a work, no matter if it is abstract or representational. In the eye-movements, the individual differences in attention profiles of participants concerning abstract and representational artworks as well as the collective distribution of attention eye-movement patterns were more heterogeneous for abstract compared to representational artworks (Brinkmann et al. 2014). Our results indicate that abstract paintings do not evoke a more homogeneous perception than representational paintings - neither concerning eye-movements nor regarding the evaluative responses.

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Embodied Aesthetics is Organized in a Somatotopic Manner: Direct Evidence from Somatosensory ERPs

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Abstract
The term ‘embodied aesthetics’ has recently been coined to describe internal processes relating our own body and the observation of art. Here we present an EEG study using somatosensory evoked potentials (SEPs) to investigate two important questions regarding aesthetic embodiment on performing arts (dance body postures): (1) Are embodiment mechanisms specific to aesthetic perception, or general to body perception? (2) Does aesthetic embodiment follow a somatotopic organization as the one existing of our own body in the human brain? We registered SEPs after tactile stimulation in hands and feet (SEPs) during an aesthetic and perceptual discrimination task of pairs of whole body displays. We show early (P45-N80) modulation of task in the primary somatosensory cortices (SCx). Importantly, a significant interaction suggests that this effect is sensitive to a somatotopic organization, whereby we observed a different modulation when making aesthetic decisions on body dance postures, as opposed to merely perceptual decisions on the same stimuli. These results suggest embodiment mechanisms occurring in a somatotopic manner during aesthetic evaluation of bodily artworks.

Keywords: Embodiment, aesthetics, body perception, dance, somatosensory, somatotopic, EEG, somatosensory evoked potentials (SEPs).

Introduction
The concept of embodiment has recently received much attention, and it has been suggested that aesthetic experience may involve an embodiment simulation of actions, emotions and corporal sensation (di Dio & Gallese, 2009; Freedberg & Gallese, 2007). Recent studies using functional magnetic resonance imaging (fMRI), transcranial magnetic stimulation (TMS), and Electroencephalography (EEG) have described a link between sensorimotor responses and aesthetic processing of human movement (Calvo-Merino, Jola, Glaser, & Haggard, 2008; Kirsch et al., 2013), body postures (Calvo-Merino, Urgesi, Orgs, Aglioti, & Haggard, 2010), sculptures (Di Dio, Macaluso, & Rizzolatti, 2007) and abstract paintings (Sbriscia-Fioretti, Berchio, Freedberg, Gallese, & Umiltà, 2013). These studies consistently report activations in sensorimotor areas and somatosensory cortices (SCx) during the aesthetic process and have been taken as an index of embodiment mechanisms.

Specifically, the term embodiment refers to an internal simulation of the external world with one’s own body. To understand the nature of the embodiment mechanism during aesthetic perception it is necessary to observe the general property of the representation of our own body in the human brain: its somatotopic structure. Both the primary motor cortex and the primary somatosensory cortices hold a representation of our own body organized in a broadly somatotopic fashion (Penfield & Rasmussen, 1950), whereby individual body parts are localized in specific cortical regions. This is an important feature of the bodily representation in cortex that may play an important role for understanding embodiment or recruitment of our own body during perceptual process.

This study sought to clarify the nature of embodiment during aesthetic processing by directly measuring activity in the somatosensory cortices (primary -SI, and secondary -SII) by means of somatosensory evoked potentials (SEPs). Specifically, two questions were addressed. The first one relates to the general vs specific nature of embodiment during aesthetic perception of the human body. In other words, is embodiment during aesthetic perception of the human body different from the embodiment we experience by the mere visual observation of the body? The second question refers to the organization of aesthetic embodiment. Specifically, it follows a somatotopic representation in primary somatosensory cortex much like the one we have of our own body?

We present a novel paradigm using EEG that allows measuring the level of embodiment in an aesthetic and a perceptual task. Precisely, we evoked SEPs in different body cortical representations of the SCx by applying small touches in hands or feet. Simultaneously, an aesthetic or perceptual discrimination task performed on body postures pairs that differed on either upper or lower limbs. We will explore differences in SEPs during congruent trials (those where the touches happen in the hand, and the body posture change in the upper limbs/arms) and incongruent trials (touches happens in the hand, and the body posture change in the upper limbs/arms). This ‘congruency’ effect would suggest a different level of engagement of the particular part of a body depending on the observed body part. Importantly, its differential contribution to aesthetic and perceptual processes would provide evidence towards the existence of...
significantly different embodiment mechanisms during the two ways of seeing human body artworks.

Methods

Participants
Twenty female participants participated in the experiment (range 18-35 years old). None of the participants had received professional dance or art training. Participants gave informed consent, with approval by the Ethics Committee, School of Social Sciences, City University London.

Visual Stimuli and Procedure
Experimental stimuli were 40 grey scaled pictures of body postures taken with a digital camera in front of white background. Postures involved different lower- and upper-limb configurations of the left and right side of the body (Figure 1). The body stimuli had been used before in a TMS experiment aiming to investigate visual and motor contributions to body perception (Urgesi, Calvo-Merino, Haggard, & Aglioti, 2007) and to aesthetic perception (Calvo-Merino et al., 2010). The postures involved complex configurations of body parts (arms and legs) in space. The stimuli clearly showed the body in a range of different, non-canonical postures. Twenty body pairs were used. Body pairs were formed by body postures that differed on either the arm position (%50) or the legs position (%50) (see figure 1 for an example). Same body pairs were used for both tasks. Pair images were created at three different levels of luminosity. This allowed small luminance differences between the body pairs that were used to perform the perceptual task.

Tactile Stimulation
We applied short taps/touches (using small solenoids) during two stages of the body processing. The first tap was applied during the initial observation of the first body posture. The second tap was applied during the evaluation (aesthetic or perceptual) of the second body posture. There were two touch (taps) conditions, one where taps were applied to the hands (index finger) (%50) and other where they were applied to the feet (toe) (%50). Half taps were applied to the left and half to the right hand or foot.

Design
We used a 2x2x2 design with factors; task (aesthetic, perceptual), visual stimuli changes (arms, legs) and touches (arms-index finger, legs -toe). We defined an index of somatotopic embodiment as the congruency between the body part touched and the observed body posture limb changes (arms/legs) (see figure 1). For example, the congruent condition will include those trials with change in the upper limbs of the observed posture pair and touches in the hands, and changes in the lower limbs of the body posture pair and touches in the feet. Incongruent trials will be those with change in the upper limbs of the body posture pair and touches in the feet, and changes in the lower limbs of the body posture pair and touches in the hands.

EEG Recording and Data Analysis
EEG was recorded with active electrodes from 60 scalp electrodes mounted equidistantly on an elastic electrode cap (M10 montage; EasyCap GmbH, Herrsching, Germany). All electrodes were referenced to the right mastoid and re-referenced to the average reference off-line. Continuous EEG was recorded using a BrainAmp amplifier (BrainProducts, Munich, Germany; 500 Hz sampling rate). Off-line EEG
analysis was performed using Vision Analyzer software (BrainProducts, Munich, Germany). The data were digitally low-pass filtered at 40Hz. The EEG signal was epoched into 500 ms segments, starting 50 ms prior to tactile stimuli onset. Segments were then baseline corrected to the first 50 ms and artifact rejection was computed eliminating epochs with amplitudes exceeding ±80 microvolts.

Single subject somatosensory evoked potentials (SEPs) for each condition (task: aesthetic, perceptual discrimination), touch (hand, foot) and visual stimuli change (arms, legs) were calculated and used to compute SEP grand-averages across subjects. Congruent trials were computed by combining congruent touch and visual change body part (i.e. trials where touch is applied to the hand, and visual changes occurs on the hands/arms). Incongruent trials were computed by combining incongruent touch and visual change body part (i.e. trials where touch is applied to the hand, and visual changes occurs on the feet/legs). Single subject average SEPs were computed for congruent and incongruent trials in both tasks. One participant had to be discarded due to problems during recording, four participants had to be discarded due to excessive noise or a very reduce (>10) number of segments per condition, leaving a sample for data analysis of 15 participants.

To analyze the task and congruency effect to measure the nature of embodiment in the primary somatosensory cortex we calculated mean voltages of the amplitudes in the four conditions between 45and 80ms. This time window includes two classical components representative of SI activity (P45-N80) on a series of electros where the evoked somatosensory response was maximum. Finally, this paper presents only preliminary data, and we focus the analysis on (a) the somatosensory evoked potentials in (a) the hand condition only and (b) in those ones occurring in the evaluation section of the trial (touches during the aesthetic/perceptual discrimination).

Results

We performed a repeated-measures ANOVA of mean somatosensory-evoked activity with factors task (visual discrimination, aesthetic discrimination), congruency (congruent, incongruent) and electrodes in a time window (45-80ms) that comprises the two components that are often associated with primary somatosensory cortex (P45 and N80). We found a main effect of task F(1,14) = 10.09, p < 0.01, indicating difference involvement in the primary SCx during the aesthetic and the visual discrimination task. Interestingly, we also found an interaction between task and congruency F(1,14)= 4.99, p < 0.05. This interaction is illustrated in Figure 3. Paired t test showed early somatosensory activity did not differ in the congruent condition between the two task, however, different levels of somatosensory engagement are observed in the incongruent condition between the two task t(13) = -4.075, p= 0.001. As we can observe in figure 3, there is a reduced negativity in incongruent trials in the aesthetic task, while negativity increases in the same condition during the perceptual task.

Overall, the task main effect and the interaction (task x congruency) suggest that the primary somatosensory cortex, is sensitive to different ways of looking at the body, and importantly, when embodying the external body in an aesthetic task, we do so in a different somatotopic manner than when performing a mere perceptual task on the same body stimuli. This suggests a specific mapping onto our own body when observing a body in an aesthetic context.

Discussion

We present a study on the properties of embodiment during aesthetic perception of human body postures. The concept of embodiment during perception is intrinsically related to an automatic involvement of our own body. Since primary somatosensory cortex holds a detailed representation of our own body and it is organized in a somatotopic manner, we further explored the embodiment mechanism during aesthetic perception in relation to the organization of our own body in the brain. In particular, we aimed to clarify if this is a general mechanism that responds every time to watch a human body or if it is particularly modulated by different ways of seeing (i.e. aesthetic perception). We measured somatosensory activity by means of somatosensory evoked potentials in a visual discrimination task and an aesthetic discrimination task. We found differential activations in early (40ms-80ms) components (between P45-N80). This early separation of
responses is indication of specific primary somatosensory activation, suggesting that this primary sensorial region is influenced by aesthetic perception of the human body at a very early stage of processing.

In order to understand the organization of embodiment in SCx, we developed a paradigm that allowed us to test if embodiment through vision of the human body follows influences SCx in a somatotopic manner, much like the somatotopic organization of our own body in the SCx, as if this is sensitive to an aesthetic context. To test for somatotopic effects in aesthetic perception, we applied small tactile stimuli to the hands or feet, while the pair of stimuli which had to be discriminated with regards to aesthetic perception was different either in hands/arms or feet/legs. As Figure 1 shows, we considered congruent trials as those where the touches and the visual changes were in the same body parts (i.e. hand touches, hand changes). Incongruent trials were defined as those where the touches and the visual changes where in different body parts (i.e. hand touches, feet changes). Our results show an interaction between the two tasks and the type of congruency (congruent, incongruent) in early somatosensory activity (mainly N80). This interaction was explained by a larger difference in the incongruent trials between the visual and aesthetic task, whereas no differences were found between congruent trials in both tasks. Interestingly, incongruent trials showed a significant reduced negativity in the aesthetic task, while the opposite the pattern (increased negativity) was found in the perceptual incongruent trials.

These results suggest that primary SCx is sensible not only to the way of seeing human bodies (visual vs aesthetic discrimination), but that aesthetically embodying an external body stimulus occurs in a somatotopic manner quantitatively different than when embodying stimuli merely based on perceptual discrimination (i.e. in this study, by trying to detect change in luminance).

There are a few aspects that are important to consider with regards to the present results. During our paradigm, we presented pairs of body postures to be evaluated in under perceptual or aesthetic context. In any kind pairwise discrimination task, the first stimulus is held in short term memory until the second stimulus is presented. Once the second stimulus is on the screen, a decision must be made between the previous body posture and the current one. The data we presented here focus on the brain responses in somatosensory cortex during the decision making process (either aesthetic or perceptual). Further analysis investigating the somatosensory responses during the presentation of the first body stimulus and the comparison with the second stimulus presentation may also inform us of how embodiment mechanism operates during other stages in the aesthetic context.

Finally, our results contribute to the emerging field of aesthetic research by providing further understanding about how the cortical representation of our own body (as reflected by primary somatosensory activity organized in a somatotopic manner) is engaged during aesthetic perception of body artworks, and suggests that a similar somatotopic organization is followed during the embodiment mechanism.

Acknowledgments
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References
Cognitive States of Potentiality in Art-Making

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Abstract
Creativity is thought to involve searching and selecting amongst multiple discrete idea candidates. Honing theory predicts that it involves actualizing the potentiality of as few as a single ill-defined idea by viewing it from different contexts. This paper reports on a study that tests between these theories. Participants were invited to “Create a painting that expresses yourself in any style that appeals to you,” and asked “Were all of your ideas for your painting distinct and separate ideas?” Naïve judges were provided with descriptions of the two theories of creativity, sample answers, and practice responses to classify. The judges were significantly more likely to classify the artists’ responses as ‘H’, indicative of honing theory rather than ‘S’ indicative of a search/select view of creativity.

Keywords: Art; Creative process; Honing; Potentiality; search space.

Introduction
Creative processes are commonly thought to involve search through a space of possibilities, or the generation of multiple discrete, well-defined candidate ideas followed by selection and exploration of the most promising of them (Runco, 2006). It might seem self-evident that this is the case; how could it be otherwise? However, a different view of creativity is suggested by work on a theory of concepts designed to tackle the difficult problem of modeling how concepts combine. The theory that emerged out of this work, honing theory predicts that creativity involves the merging and interference of memory items resulting in as few as a single cognitive structure that is ill-defined, and can be said to exist in a state of potentiality, and which can be formally described as a superposition state. The idea becomes increasingly well-defined, and transforms from potential to actual through interaction with both internally generated and externally generated contexts. The idea could actualize in different ways depending on the contexts the idea interacts with, or perspectives it is viewed from. Elements of the seed idea have the potential to grow organically out of earlier elements. In short, honing theory posits that creative ideation involves actualizing the potentiality of as few as a single ill-defined idea by viewing it from different contexts.

These different views of creativity make very different predictions about the state of an idea mid-way through a creative process. This paper reports on a study designed to test between these theories by asking individuals engaged in an art-making task about their conception of their painting mid-way through their creative process.

Background
Inspired by the metaphor of the mind as a computer (or computer program), early research on creativity focused on the notion of heuristic search, in which rules of thumb guide the inspection of different states within a particular state space (set of possible solutions) until a satisfactory solution is found (Eysenck, 1993; Newell, Shaw & Simon, 1957; Newell & Simon, 1972). In heuristic search, the relevant variables are defined up front; thus the state space is generally fixed. Examples of heuristics include breaking the problem into sub-problems, hill-climbing (reiteratively modifying the current state to look more like the goal state), and working backward from the goal state to the initial state.

The idea that creativity could be construed as heuristically guided search gave hope to those who sought a scientific understanding of creativity because search is a formally tractable process. However it was soon recognized that in many creative tasks, and particularly artistic forms of creativity, the goal state is unspecified, and some elements of the eventual solution may not be present when the problem presents itself. It has been suggested that creativity involves heuristics that guide the search for, not a possibility within a given state space, but a new state space itself (e.g., Boden, 1990; Kaplan & Simon, 1990, Ohlsson, 1992).

One of the most well known theories of creativity is the Geneplore model (Finke, Ward, & Smith, 1992). This theory posits that the creative process consists of two stages: generate and explore. (Indeed the name ‘Geneplore’ is a condensation of ‘generate’ and ‘explore’.) The first stage involves the generation of crudely formed ideas referred to as pre-inventive structures that contain the kernel of an idea as opposed to an idea in its entirety. The exploration stage involves fleshing out these pre-inventive structures through elaboration and testing. Use of the term ‘exploration’ to refer to the second phase of the creative process can be misleading because the term ‘explore’ is often used to refer to surveying the space of possibilities as generally occurs during the first phase of the creative process, as opposed to refining a single possibility as generally occurs during the second phase. However, the notion of a pre-inventive structure does capture
the intuition that early on in the creative process one is working with cognitive structures that are different in kind from those one is working with later in the creative process. The Geneplore model does not attempt to formalize how a pre-inventive structure differs from a full-fledged idea, nor what differentiates a promising pre-inventive structure from a mundane one.

Another well-known theory of creativity is the Darwinian theory of creativity (Campbell 1960; Simonton, 1999, 2007, 2010). As do biological species, creative ideas exhibit the kind of complexity and adaptation over time that is indicative of an evolutionary process, not just when they are expressed to others, but in the mind of a single creator (Gabora, 1997; Terrell, Hunt & Gosden, 1997; Thagard, 1980; Tomasello 1996). Thus it has been proposed that in creativity, as in natural selection, there is a process conducive to generating variety, and another conducive to pruning out inferior variants. According to the Darwinian theory, we generate new ideas through an essentially a trial-and-error process involving ‘Blind’ generation of ideational Variants followed by Selective Retention of the fittest variants for development into a finished product. Thus the Darwinian theory is sometimes referred to as BVSR. The variants are said to be blind in the sense that the creator has no subjective certainty about whether they are a step in the direction of the final creative product.

A different view of creativity is suggested by work on a “quantum” theory of concepts designed to tackle the difficult problem of modeling how concepts combine (Aerts, 2009; Aerts, Aerts, & Gabora, 2009; Aerts, Broekaert, Gabora, & Veloz, 2012; Aerts, Gabora, & Sozzo, 2013; Busemeyer, & Bruza, 2012; Gabora, & Aerts, 2002). This theory was developed to cope with the contextuality and noncompositionality of concepts, which make them resistant to formal description. The mathematical formalism of quantum mechanics was developed to describe phenomena that were first observed in the quantum world but that appear also in psychology. One advantage of a quantum model over a classical one is that it uses variables and spaces that are defined specifically with respect to a particular context. The quantum formalism provides a natural spatial representation of a state in a context such that variables are natively context specific.

This theory of concepts led to an alternative view of how the creative process works (Gabora, 2005). Honing theory purports that initially a creative idea exists in an ill-defined state of potentiality that can be formally described as a superposition state. This “seed idea” is experienced as vague because it consists of components potentially derived from multiple sources merged together, and the challenge is to hone it into a well-defined whole. The seed idea transforms from potential to actual through interaction with both internally generated and externally generated contexts. This theory proposes that the idea could actualize in different ways, depending on the context the idea interacts with, and that the elements of the idea, have the potential to grow organically out of earlier elements. This theory was in part inspired by extensive discussion with creative individuals, who invariably describe their creative process as involving thinking about an idea from different perspectives as opposed to search and selecting amongst candidate ideas.

The hypothesis that creative thinking involves, not generating and selecting amongst multiple well-formed candidates, but superposition of relevant memory items to give as few as a single candidate that undergoes honing, was tested in an analogy making task (Gabora & Saab, 2011). The ‘search and select’ view is assumed in the structure mapping (SM) theory of analogy (Gentner, 1983), according to which (in brief) analogy generation occurs in two steps: first, searching memory in a “structurally blind” manner (Gentner, 2010, p. 753) for an appropriate source and aligning it with the target, and second, mapping the correct one-to-one correspondences between the source and the target. Thus, structure mapping assumes that candidate sources are considered separately, and once the correct source is found the analogy making process occurs in isolation from the rest of the contents of mind. This stands in contrast to honing theory in several respects. First, quite the opposite of being “structurally blind”, the initial stage of analogy making is thought to be constrained by the content-addressable structure of associative memory to retrieve items that are in some way (although not necessarily the right or most relevant way) structurally similar (Gabora, 2010). Second, honing theory suggests that alignment and mapping may work with, not discrete, predefined structures, but an amalgam of multiple items previously encoded to the neural cell assemblies activated by the target, which in the present context are not readily separated. Third, the process is thought to proceed not by mapping more correspondences but by weeding out non-corrrespondences.

Participants in the analogy problem solving study were interrupted midway through solving an analogy problem and asked what they were thinking in terms of a solution. Naïve judges categorized a response as H if it met the predictions of honing theory, i.e., if there was evidence of merging solution sources from memory resulting in an ill-defined idea. They categorized it as SM if it met the predictions of structure mapping, i.e., if participants had not finished mapping relations from source to target. Both the frequency counts and mean number of SM versus H judgments supported the hypothesis derived from honing theory that midway through creative processing an idea is in a potentiality state.

This was a first source of empirical evidence that creative thinking is divergent not in the sense that it moves in multiple directions or generates multiple possibilities, but in the sense that it produces a raw idea that is vague or unfocused, that requires further processing to become viable. However, analogy problem solving is a highly constrained task, with a single correct solution, and one could argue that this is uncharacteristic of most creative tasks. The goal of the current research is to show that the honing theory of creativity is broader than just analogy problem solving, that it applies to less constrained, open-ended task such as art making. This is the first study to investigate between the
above two views of how the creative processes works using an open-ended task. We hypothesized that midway through the process of completing a painting the mind of the artist is in a state of potentiality, i.e., the idea the artist has is vague or half-baked, and in different contexts it could manifest different ways. We propose that the creative process works through honing an idea such that it transforms from ill-defined to well-defined, as opposed to search and selection from amongst a collection of well-formed candidate ideas. Attempting to distinguish between these competing theories of creativity helps us to understand how creative ideas arise and take shape, and thus enables us to gain insight into human innovation.

Method

The study consisted of two components, carried out separately. The first involved the generation of artworks and the answering of questions concerning the art-making process. The second involved classifying these responses in ways that were indicative of either honing theory or a search and select type theory.

Participants

The participants were undergraduates enrolled in psychology courses at the University of British Columbia who were participating in order to receive class credit. There were two types of participants: 56 who created paintings and answered questionnaires, who will be referred to as artists, and 11 who judged the artists’ answers to the questionnaires, who will be referred to as judges. All participants were naïve concerning the rationale for the study.

Protocol for Artists

Materials: Between two and eight artists participated at a time. The artists’ were seated at desks placed in a circle, with each individual facing outwards, such that they could not see each others’ art. Each artist’s desk had paintbrushes of two different sizes and an ice cube tray containing seven different colors (pink, white, yellow, green, brown, blue, and red) of acrylic paint. Each desk also had a glass of water and towelettes for cleaning the paintbrushes, and a plastic plate for mixing colors. Additionally, on the desk was a set of ten Crayola washable watercolor paints in plastic jars, pencil crayon pastels, chalk pastels, oil pastels, and two pieces of paper towel, a piece of watercolor paper, and a piece of paper for acrylic paints.

Handouts and Art-making Protocol: Each artist was also provided with a set of handouts. The first was a consent form, and the second was a Demographics Questionnaire. Form A asked them to “Create a painting that expresses yourself in any style that appeals to you.” The experimenter told them that their artwork would not be judged in any way, and that it was only their answers to questions on Forms B, C, and D that would be analyzed. They were told that the study was concerned with peoples’ perceptions of the creative process of art making. They were told where and when they could pick up their painting if they wished to, and that if they did not pick it up it would be destroyed after one year. They were also told that none of the artwork would be photographed.

Before beginning the painting they were asked to fill in Form B, which asked:

- What are you thinking in terms of what your painting will look like? Write down your thoughts about your painting in as much detail as you can.

They were asked to start painting as soon as they finished writing their answer to the question on Form B.

After 15 minutes the artists were interrupted and given Form C, which asked them to:

- Write down your thoughts about the painting in as much detail as you can.

After they finished responding to Form C they were asked to continue their painting until it was finished.

Once they had completed their painting they were given Form D, which asked:

- Were all of your ideas for your painting distinct and separate ideas?

In a Pilot Study with 15 participants there was an additional question on Form D that asked: Do you think being interrupted affected how you carried out your painting? Since all of the participants answered “no” to this question it was thereafter omitted. (Had any of them answered “yes” we would have omitted Form C.)

When the artists completed Form D they were debriefed and asked if they had any questions regarding the study. They all completed the procedure within ninety minutes.

Judging

The judges did not see or evaluate any of the actual artworks; all they looked at was the artists’ questionnaire responses. Each judge was provided with a set of handouts. As with the artists, the first two were a consent form and a demographics questionnaire. The third handout described the criteria they were to use to classify artist answers as indicating of one theory or the other. It read as follows:

JUDGING CRITERIA

You will be trained how to read information about artists’ art-making processes and then put them into two categories: one that you think is indicative of one theory about the creative art-making process, and another that is indicative of another theory. You will first be given the identifying characteristics of Theory S or Theory H. You will practice on toy examples until your answers indicate that you understand the distinction between H and S, and until you yourself claim that you understand this distinction. Then you will classify the real responses as S or H.

Identifying Characteristics of Theory S

- If multiple ideas are given, they are considered separate and distinct from one another; not hard to dis-entangle.
- Does not contain extra ideas that would be relevant to other types of paintings or creative tasks but that are irrelevant to this particular painting.
- Distinct possible ways of going about the task may be separated by words such as “or” without anything to indicate these two ways are connected in creator’s mind.
- The creative process involves searching one’s mind for ways to go about the painting and selecting amongst these distinct possible outcomes.
- No common core to possible painting outcomes.
- No new emergent characteristics of painting come to light through process of resolving how initial idea for painting will be carried out.

**Identifying Characteristics of Theory H**

- If multiple ideas are given, they are jumbled together; hard to dis-entangle.
- Contains extra ideas that would be relevant to other types of creative tasks but that is not relevant to creating this particular painting.
- Ill-defined or indistinct ideas; challenge is to make them concrete.
- Common core to different possible painting outcomes; core could be taken in different directions.
- Words indicative of H theory: vague, ill-defined, indistinct, potential.
- New emergent characteristics of painting, or new self-understanding, come to light through process of resolving how initial idea for painting will be carried out; transformative.

Note: It is not necessary to meet all the criteria in order to be properly classified as indicative of one theory of the other. Also, it is not necessary to distribute your classifications evenly; it is possible that 5 in a row might be indicative of one theory and not the other. In fact it is completely possible that they all could be one theory and not the other. Please classify each answer as indicative of one theory or the other even if you are not sure of your answer.

The Judging Criteria Handout also contained a summary of differences between the two theories provided in Table 1. The judges were told that a flat-out ‘yes’ to ‘Were all of your ideas for your painting distinct and separate ideas?’ was indicative of S and a flat-out ‘no’ was indicative of H.

The judges were given the 56 questionnaires, and a form on which to classify the artists’ answers as indicative of either H or S. They were told “If you are not sure just go with your gut feeling”.

**Table 1: Characteristics used to judge responses as Search and Select (S) versus Honing (H).**

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<th>S</th>
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<td>If multiple ideas are</td>
<td>Distinct (e.g., complete ideas</td>
<td>Jumbled together (e.g., idea fragments</td>
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<td>given, they are</td>
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**Results**

Not all artists answered every question, and not all judges provided a judgment of every artist response. The intra class correlation (ICC) for the degree of agreement amongst the judges’ classifications of the responses for Forms B and C were too low to use and so were excluded from the analysis. For the question on Form D the ICC was .94, indicating high reliability.

Artist responses were classified as supporting honing theory if 6 or more judges judged it as H, and as supporting search and select if 6 or more judges judged it as S. As shown in Figure 1, 29 of the artist responses were classified by the judges as supporting of theory H, and 13 were classified as supporting theory S. A one-sample chi-square test revealed a statistically significant difference between the classifications for theory H and S, $\chi^2(1, N = 43) = 4.57, p < .05$. Thus the frequency counts support the hypothesis that the creative process involves actualization of the potential of as few as one single ill-defined idea, as predicted by honing theory, as opposed to searching and selecting from amongst multiple discrete variants, as predicted by theories such as BVSR.
A further analysis compared the mean number of judgments (out of a maximum of 11, the total number of judges) across all responses that supported each theory. Taking the mean across all 56 responses, the mean number of S judgments was 9.67 (SD = 0.47), and the mean number of H judgments was 4.35 (SD = 0.47). A paired-sample t-test showed that the difference was significant $t(55) = 2.64, p < .05$, and the effect size ($\eta^2 = .38$) was large. Thus these data corroborate the above frequency count findings. The mean judgment scores for structure mapping and actualizing potentiality are given in Figure 2.

**Discussion**

This study investigated whether the mind of the artist is in a state of potentiality midway through the open-ended creative task of art making, helping us to better understand how the creative process works. Our goal was to determine if creative ideas arise through the generation of multiple, discrete, well-defined possibilities that are then explored, tweaked, and selected amongst, or if creative ideas arise through the merging of memory items resulting in a single cognitive structure that is ill defined, thus existing in a state of potentiality that becomes more well-defined as it interacts with internally or externally generated contexts. Our results support the hypothesis that the creative process works through honing—actualization of potentiality—as opposed to search and selection. Although this hypothesis had previously found support with respect to analogy problem solving (Gabora & Saab, 2011), this is the first study to investigate and support that it also holds true for this open-ended creative task of art making.

The data collected for the study reported here was part of an Honours Student project and it was carried out with the view of ironing out the kinks in the procedure and thereby paving the way for a larger study of this sort in the future. There are several limitations to the research reported here. First a larger subject pool is required; perhaps due in part to the creatively demanding nature of the task it, was difficult to get enough participants to obtain statistically significant results. Second, in future studies that use this protocol, more time should be spent with the judges to ensure that they can consistently judge the more open-ended questions (Forms B and C) as well as the more clear-cut question on Form D. Future research should also investigate the role of potentiality states in other types of creative tasks. Another aspect of the study that could be improved is the questionnaires. Future studies should expand on the types of questions and carry out extensive pilot studies to assess their inter-rater reliability in order to tap into the cognitive processes during a creative task more adequately. In addition, the questionnaires could be complimented by behavioral observations of the artists at work so as to not be relying completely on self-perceptions of their creative process. Nevertheless we view the results as a promising step forward to empirically investigating the cognitive process by which creative works come into being.

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The Effects of Stimulus Type in Aesthetic Preference Research: A Meta-Analysis

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Abstract

A meta-analysis investigated effects of stimulus types in aesthetic preference studies. Analytic stimuli are artworks; synthetic stimuli are equivalent; outcomes as effect sizes (ES) would be homogeneous and inference-sufficient. The study derived 1266 ESs, 166 ESs from experimental and 1100 from correlational designs. ESs grouped on stimulus type were heterogeneous in both. For experimental studies using analytic stimuli, mean ES = 0.774; for those using synthetic stimuli, mean ES = 0.520. For correlational studies using analytic stimuli, mean ES = 0.420; for those using synthetic, mean ES = 0.340. No substantive or methodological variables accounted for heterogeneity. The stimulus types elicited different responses, with analytic eliciting higher measures overall and in a majority of subsets.

Keywords: Aesthetic preference; meta-analysis; aesthetic response

Introduction

In 1865, Gustave Fechner used synthetic stimuli, cardboard rectangles of varying proportions, to investigate aesthetic preference for objects designed according to the golden section (Arnheim, 1986). In a later study (1871), he used analytic stimuli, two versions of Holbein’s, Madonna with Burgomaster Meyer exhibited side by side in a Dresden museum). Fechner’s two studies made an assumption that underlies virtually all subsequent empirical aesthetics research: that aesthetic preference, conceived as pleasure or displeasure, is elicited by the stimulus object’s physical properties, particularly its formal properties such as line, shape, color, texture, value, etc. Distinction between stimulus objects as art or non-art was assumed to be irrelevant since stimuli in both categories of visual objects possess formal properties. Daniel Berlyne (1971), Rudolf Arnheim (1986), and others acknowledged that the use of different stimuli raised questions of internal and external validity. Some scholars speculated that there were no differences between stimuli’s effects on outcome measures; others argued that there were indeed differences despite the absence of empirical evidence.

Fechner’s goal was to construct an “aesthetics from below,” empirical aesthetics, to augment “aesthetics from above,” or philosophical aesthetics, (Arnheim, 1986). His contributions include the use of experimental methods; the operationalization of aesthetic experience as pleasure/displeasure; the assumption that stimulus properties determine aesthetic response; and the use of both analytic and synthetic stimuli.

Building on Fechner’s work, Berlyne (1971) applied experimental methods and designs to empirical aesthetics inquiry—and situated it as a behaviorist project. He conceived pleasure/displeasure behaviors as changes in arousal elicited by intrinsic stimulus properties. Berlyne used the term hedonic value to describe the ability of intrinsic stimulus properties to elicit changes in arousal that constituted aesthetic behavior. Positive hedonic value elicits pleasure, negative evokes displeasure. Positive hedonic value moderately increases arousal or decreases uncomfortably high arousal. Arousal potential of a stimulus is determined by the intensity of its intrinsic properties. These include formal properties and collative properties, (i.e., rated diametric characteristics such as novel/familiar, complex/simple, certain/uncertain, normal/incongruous, etc.). Berlyne and other scientists used the Wundt curve to describe the relationship between hedonic value and aesthetic response (1971).

Researchers used three operational definitions of aesthetic behavior as the dependent variable. The first was verbal ratings or evaluative judgments such as the semantic differential, Likert scale, and similar numerical scales. Scales for verbal ratings included descriptive scales referring to collative properties of the stimulus; evaluative scales indicating hedonic value and related attributes; internal-state scales which indicate the subject’s mood or reactions while exposed to a stimulus; and stylistic scales referring to formal, physical or technical properties of the work of art. Subjects’ responses of primary interest were ratings of preference, pleasingsness, interestingness, and complexity. A second operational definition of aesthetic response included psychophysical measures in which the researcher recorded bodily processes assumed to indicate emotion or arousal elicited by the stimulus such as respiration rate, pupil dilation, and galvanic skin response. A third operational definition utilized measures of exploratory or stimulus-seeking behaviors in response to the collative variables or formal properties of the stimulus. Measures of exploration time, looking time, listening time, or exploratory choice were recorded and regarded as curiosity or intensity of attention.

In Berlyne’s theoretical scheme, as well as in subsequent research by others, the independent variable was either synthetic or analytic. He justified the use of both types on methodological grounds surrounding the internal/external validity dichotomy (1971). Synthetic stimuli permit the researcher to isolate the independent variables so as to be reasonably certain which are responsible for the observed aesthetic responses. He admitted, “it might be objected that (synthetic stimuli) miss some of the essential and decisive attributes of art,” and thereby might limit generalization to
artworks. Yet, he also acknowledged that the use of analytic stimuli might preclude causal inferences. Berlyne saw a resolution to the internal/external validity problem in the continuation of the research program, believing that in the early stages, synthetic stimuli were indispensable to identify promising variables and would later be replaced by analytic stimuli offering greater applications to the art world (1971).

Rudolf Arnheim was skeptical, writing, “Inevitably, the use of fairly simple and neutral stimuli...lead(s) to results that differ from responses to actual works of art,” (1986). Hardiman and Zernich, in a narrative review of over one hundred studies of aesthetic preference, concluded that preference behavior was not altered by the type of stimulus object (1975). However, it should be noted that neither Arnheim nor Hardiman and Zernich based their findings on empirical data.

Despite almost 400 empirical studies of aesthetic experience since Fechner's work, the research has added little to our understanding of “aesthetics from below.” Berlyne (1971) called progress in empirical aesthetics, “fittful and desultory.” Salkind and Salkind (1979) ironically observed that about the only conclusion possible from the entire body of research is that some subjects prefer some paintings more than others. Studies by Child (1969) and Gardner and Gardner (1973) exemplify the equivocal nature of this body of research. Child found that children did not express the same preferences as adults on sets of pairs of paintings grouped on similarity of formal properties (1969). Gardner and Gardner found, however, that seven-year olds, when asked for their preferences among geometric forms, expressed the same preferences as adults (1973).

From the beginnings of Fechner’s empirical aesthetics research, the nature of the stimulus has been considered crucial to aesthetic response. However, this body of research has proceeded under the assumption that differences between analytic and synthetic stimuli are negligible in their effects on aesthetic preference. The difficulty is that, while some stimulus properties are believed to determine aesthetic response, other properties, such as ones that distinguish between art or non-art categories, are assumed in the absence of empirical evidence, to have no effect. John Dewey (1934) took the position that there is an aesthetic dimension in all forms of human experience. This would include synthetic stimuli as well as works of art. However, it does not necessarily follow that the intensity or nature of aesthetic experience with various types of objects are equivalent.

**Methods**

The present study used a model of meta-analysis developed by Hembree (1985) based on the work of Glass, McGaw, and Smith (1984). Computer searches of research reports and searches of the bibliographies of books, research reports and other sources of fugitive studies located 378 studies of aesthetic preference. No study was excluded *a priori*. Studies that failed to report sufficient data to compute *ES*s and studies with samples of less than 10 were excluded, as were marketing studies, studies using architecture, environmental images, and color. Only studies of visual preference were included. A total of 182 studies were retained.

The dependent variables were the study outcomes expressed as effect sizes (*ES*s). A total of 2266 *ES*s were derived. In experimental/factorial studies, *ES* was defined as the standardized mean difference between the control and experimental groups. Experimental studies’ *ES*s were corrected for measurement error and data dependence and designated [\(g\)]. Correlational studies *ES*s were converted to Pearson *r* and then to Fisher’s *Z*, and designated [\(Z\)].

The independent variables and correlates were substantive and methodological study characteristics on which subsets were formed as meta-analysis proceeded. Substantive IVs and correlates are those deemed relevant to aesthetic preference and stimulus type. The IVs and correlates were:

1. **Stimulus type**, either analytic (AN) or synthetic (SYN); type of operational definition of aesthetic response, either verbal ratings (VR), exploratory behavior (EB), or psychophysical measures (PM); subject variables (SuV) such as age, gender, IQ, art training; stimulus variables (StV) such as style, collative properties, formal properties; both subject and stimulus variables (SuStV); and publication type, either dissertation (PD) or peer-reviewed journal (PJ).

Methodological variables were study characteristics that might moderate *ES*: publication year (PY) and Quality (Q), which consisted of researcher ratings of sampling, data analysis, control of error, etc. The rating system is specified in Hembree’s model (1984).

In the meta-analysis, all sets and subsets were tested for homogeneity. If homogeneous, the set or subset was inference-sufficient. If heterogeneous, the mean *ES* was regarded as a descriptive statistic and the search for the cause of heterogeneity proceeds. The strategy was hierarchical. In Phase I, sets of *ES*s ([\(g\)]) from experimental studies and sets from correlational studies ([\(Z\)]) were tested separately for homogeneity. If *ES* sets were heterogeneous, a search for the cause of the heterogeneity continued to Phase II, grouping *ES*s into subsets according the substantive independent variables and retesting for homogeneity. If homogeneous, these subsets were further divided by stimulus type and retested for homogeneity. If Phase II failed to yield homogeneous *ES* groups, the meta-analysis turns to Phase III, the search for moderating variables among the methodological IVs by multiple regression analysis and expressed as the adjusted multiple coefficient of determination, \(amr^2\). Three outcomes were possible. (1) Sets or subsets of *ES* could be found to be homogeneous. If the Stage I overall set of *ES*s were homogeneous, *ES* would be independent of all variables including stimulus type and would support the observation that stimulus type differences have no effect on study outcome. If Phase II subsets formed on stimulus type-within IV were homogeneous, then stimulus type would be inferred to affect study outcome differentially. Mean *ES*s and confidence intervals would indicate the direction and degree of difference in aesthetic response associated with each stimulus type. (2) Sets or subsets of *ES*s...
could be found to be heterogeneous, but with variance due to moderating variables. Significant relationships between moderating variables and ESs would indicate amounts of variation unattributable to stimulus type. Non-significant relationships would indicate variations possibly associated with stimulus type or other variable(s). (3) Subsets could be found to be heterogeneous with unexplained variation. Mean ESs, as descriptive statistics, would provide evidence relevant to the research question. Differences between mean ESs for analytic studies and synthetic studies would raise doubts regarding the assumption that stimulus types are equivalent for the 182 studies included in this meta-analysis.

Results

For the 166 experimental/factorial studies, the mean ES was 0.557, while mean ES for all 1100 correlational studies was 0.331. For the set of all experimental/factorial studies using analytic stimuli, the mean ES was 0.728; for those using synthetic stimuli, mean ES was 0.435. Thus, analytic stimuli elicited measures of aesthetic preference almost 0.3 standard deviations higher than responses to synthetic stimuli. Subsets from correlational studies also had different mean ESs. For those using analytic stimuli, mean ES = 0.271, while for studies those synthetic stimuli, mean ES = 0.401. Since heterogeneity remained in all Phase I sets and subsets, mean ESs apply to the 182 studies included in this meta-analysis.

Table 1: Mean ESs gi, Zi, and n for Sets and Subsets Grouped by Stimulus Type.

<table>
<thead>
<tr>
<th>Stimulus Type</th>
<th>Mean ES, n</th>
</tr>
</thead>
<tbody>
<tr>
<td>All g</td>
<td>0.557, 166</td>
</tr>
<tr>
<td>All Z</td>
<td>0.331, 1100</td>
</tr>
<tr>
<td>gS using AN</td>
<td>0.728, 70</td>
</tr>
<tr>
<td>gS using SYN</td>
<td>0.435, 96</td>
</tr>
<tr>
<td>ZS using AN</td>
<td>0.271, 592</td>
</tr>
<tr>
<td>ZS using SYN</td>
<td>0.401, 500</td>
</tr>
</tbody>
</table>

Further analysis revealed stimulus type differences within subsets formed on the independent variables. Consistent with those of the overall groups, ES means of the Phase II subsets using analytic stimuli differed from ES means of their synthetic counterparts, with analytic ESs greater than synthetic ESs in the majority of subsets. All sets and subsets were heterogeneous. The majority of higher ESs, 59%, occurred in studies using analytic stimuli. Moderating variables year of publication and study quality were found to have weak effects on ES throughout, with statistical significance in 13 of the subsets. However, their low n’s and low amr2s accounted for such minimal variation as to be of no practical significance to the research question. No explanation for heterogeneity was found.

The results raise doubts about the assumption of equivalence of analytic and synthetic stimuli’s effects on study outcomes. Persistent differences between mean ESs of sets grouped by stimulus type support the conclusion that in the studies in the meta-analysis, analytic produced outcomes different from those of studies using synthetic stimuli. Also, higher analytic mean ESs in a majority of the subsets supports the conclusion that analytic stimuli elicit higher measures of aesthetic preference than synthetic stimuli in the studies.

Discussion

John Kennedy (1975) noted that inquiry on pictorial perception investigates the phenomena of direct and indirect perception. Direct perception is the perception of the physical dots or marks on the surface of a visual display. Indirect perception is the perception of the dots, marks, or brushstrokes as meaningful; i.e., representing something outside themselves, say a letter of the alphabet or an impressionist landscape painting. Some visual displays allow only direct perception; some allow both types. An example of the latter is a half-tone newspaper photograph. Depending on dot size, which is varied for printing quality, differing amounts of direct and indirect perception can occur. If both analytic and synthetic visual stimuli involve varying amounts of direct and indirect perception, difference in the effects of stimulus types should be expected. The cognitive tasks involved in indirect perception, i.e., processes involved in the recognition that dots, marks, or brushstrokes meaningfully represent objects or phenomena in the world, may be associated with higher levels of aesthetic response.

Eleanor Rosch’s studies of cognitive categorization (1975) may further open the cognitive dimensions of aesthetic experience. She found that thought is organized as basic level categories and prototypes. Rosch posited a two-dimensional model in which the vertical dimension indicates inclusiveness or abstractness. The examples robin, bird, and animal all lie on the vertical axis on the basic, subordinate, and superordinate levels, respectively. Since the basic level most closely reproduces the physical world, it is the most inclusive level at which meaningful visualization takes place. On the horizontal axis of Rosch’s model, items form categories on the basis of degree of consistency with a prototype, which is the most representative member of the category. Members are not distinguished by clear-cut boundaries. Analytic stimuli appear to operate at the basic level, the most inclusive category for which a concrete visual image can be formed. Synthetic stimuli operate at a sub or superordinate level since they are usually more abstracted from the visual world. Operating at different levels of Rosch’s model, the two stimulus types may elicit different degrees of aesthetic experience and therefore, aesthetic response. Further, on Rosch’s horizontal axis, analytic stimuli, which involve more indirect perception and therefore are more meaning-laden, are more prototypical of aesthetic objects than synthetic stimuli.

Wittgenstein (1953) posited a type of category in which members share common properties, but no one trait is necessary for all members. Visual stimuli, both analytic and synthetic, may comprise such a category whose members
have differing configurations of traits, including those that elicit aesthetic response. Analytic stimuli may possess more aesthetic experience-conducive traits, which coheres with the present finding that analytic stimuli elicited higher ESs in the majority of the studies included.

This consideration also brings into question the assumption made by Fechner, Berlyne, and many other behaviorist investigators of empirical aesthetics, that only the formal properties of the stimulus elicit arousal or aesthetic response. Works of art and many non-art visual displays have two other primary components in addition to formal properties. These are subject and content (meaning). Both of these may be involved significantly in the cognitive processes of aesthetic experience.

The unremitting heterogeneity in this study raises concerns about construct validity. The severely reductionistic definition of aesthetic experience seems at issue. The three operational definitions of aesthetic behavior, verbal ratings, psychophysical measures, and exploratory behavior, while observable, may have failed to capture aesthetic experience as a phenomenon that involves the formation of meaning and object recognition. Further, the operational definitions’ focus may not have been as precise as researchers thought. Schacter’s 1964 research on emotional labeling found that there were few physiological differences among the emotions. Angry people experience similar increases in blood pressure, heart rate, etc., as those who are ecstatic.

John Dewey (1934) took the position that there is an aesthetic dimension in all forms of human experience, not just art. This position is prevalent today. However, it does not necessarily follow that the nature of aesthetic experience is equivalent across all these various forms. Continued research is necessary to determine more precisely the effects of various forms of stimuli on aesthetic experience.

References

Table 2: Mean ESs $g_i$, $Z_i$, and $n$ for Sets and Subsets Grouped by Independent Variables.

<table>
<thead>
<tr>
<th></th>
<th>VR</th>
<th>EB</th>
<th>PM</th>
<th>SuV</th>
<th>StV</th>
<th>SuStV</th>
<th>PD</th>
<th>PJ</th>
</tr>
</thead>
<tbody>
<tr>
<td>$g$</td>
<td>0.539</td>
<td>0.721</td>
<td>0.428</td>
<td>0.536</td>
<td>0.617</td>
<td>0.436</td>
<td>0.604</td>
<td>0.541</td>
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<tr>
<td>$n$</td>
<td>134</td>
<td>16</td>
<td>12</td>
<td>88</td>
<td>58</td>
<td>19</td>
<td>45</td>
<td>121</td>
</tr>
<tr>
<td>$Z$</td>
<td>302</td>
<td>0.377</td>
<td>0.762</td>
<td>0.299</td>
<td>0.454</td>
<td>0.230</td>
<td>0.174</td>
<td>0.359</td>
</tr>
<tr>
<td>$n$</td>
<td>919</td>
<td>125</td>
<td>32</td>
<td>437</td>
<td>389</td>
<td>197</td>
<td>87</td>
<td>1022</td>
</tr>
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</table>

Table 3: Mean Effect Size $g_i$ and $n$ by Stimulus Type with Significant $amr^2$.

<table>
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<tr>
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<th>VR</th>
<th>EB</th>
<th>PM</th>
<th>SuV</th>
<th>StV</th>
<th>SuStV</th>
<th>PD</th>
<th>PJ</th>
</tr>
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<tbody>
<tr>
<td>AN</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$g_i$</td>
<td>0.719</td>
<td>0.611</td>
<td>0.839</td>
<td>0.889</td>
<td>0.623</td>
<td>0.392</td>
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<td>16</td>
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<tr>
<td>$amr^2$</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>SYN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$g_i$</td>
<td>0.375</td>
<td>0.857</td>
<td>0.503</td>
<td>0.371</td>
<td>0.671</td>
<td>0.452</td>
<td>0.357</td>
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<tr>
<td>$n$</td>
<td>69</td>
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<td>43</td>
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<td>14</td>
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<tr>
<td>$amr^2$</td>
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<td>0.108</td>
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Table 4: Mean Effect Size $Z$ and $n$ by Stimulus Type with Significant $amr^2$.

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<th>StV</th>
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<tbody>
<tr>
<td>AN</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>$Z_i$</td>
<td>0.239</td>
<td>0.771</td>
<td>0.77</td>
<td>0.258</td>
<td>0.519</td>
<td>0.106</td>
<td>0.230</td>
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<tr>
<td>$n$</td>
<td>548</td>
<td>8</td>
<td>29</td>
<td>256</td>
<td>137</td>
<td>105</td>
<td>59</td>
<td>542</td>
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<tr>
<td>$amr^2$</td>
<td>-----</td>
<td>0.914</td>
<td>0.317</td>
<td>0.331</td>
<td>-----</td>
<td>-----</td>
<td>0.204</td>
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</tr>
<tr>
<td>SYN</td>
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<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>$Z_i$</td>
<td>0.408</td>
<td>0.391</td>
<td>0.623</td>
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<td>0.446</td>
<td>0.387</td>
<td>0.008</td>
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</tr>
<tr>
<td>$n$</td>
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<td>118</td>
<td>3</td>
<td>157</td>
<td>251</td>
<td>94</td>
<td>28</td>
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</tr>
<tr>
<td>$amr^2$</td>
<td>0.146</td>
<td>0.204</td>
<td>0.103</td>
<td>0.416</td>
<td>-----</td>
<td>0.056</td>
<td>0.246</td>
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</tr>
</tbody>
</table>


Taiwanese Young Adults’ Attitudes Toward Museum Visiting

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Abstract
This study uses “past conditioned experience” as a stimulus to understand young Taiwanese adults’ attitudes toward museum visiting regarding their habits, feelings and values about museums. A total of 348 university students were investigated by a structured questionnaire. 62.6% were female and 37.4% were male. The findings indicate how attitude formation is related to conditioned experiences. Taiwanese young adults’ attitudes toward museum visiting show a positively circulating cycle between self-identity, habits, and values. On the other hand, we also find there is a discrepancy between the values of the museum experience itself and the experience in the context of teacher education. Meaningful information were uncovered for museum education to be enhanced in Taiwan.

Keywords: museum; virtual museum; school museum; school sky museum.

Introduction
Museums play a big role in preserving, gathering, displaying, communicating and interpreting knowledge materials on artifacts that have historical values for the purpose of learning and public view (Thyne, 2001). More importantly, museum is viewed as meaningful places for public dialogues and informal learning institutes. Today, museums are not just reaching out to larger audiences and building demand among new groups. They are also designing proactively the arrangements, services and offerings which will generate satisfaction and positive outcomes for their visitors. Therefore, how to bridge the learning connection between school and museum becomes a contemporary issue in art education.

Background
Art education is a required discipline across elementary, junior high and senior high grade levels. For elementary and junior high school, student has to take at least three arts class per week except 1G and 2G students. Arts education falls under the learning domain called “Arts and Humanities” and is divided into visual arts, music and performing arts (including dance and theatre). Each class at elementary school level has 40 minutes and 45 minutes for junior high. It means that all students have one class of visual arts learning per week at different grade levels. On the other hand, teaching methodology and textbooks are based on the National Curriculum Standards. The first National Curriculum Standards was written in 1912 (Chen, 2011). After ten decades, we found that the National Curriculum Standards consistently highlight the importance of teaching appreciation and making works of art.

At university level, except art majors, students have arts learning from general education. Usually, different kinds of arts class might be offered based on each university educational goals and its specific curriculum design. In general, each university values students’ arts competency, and uses it as a key index to symbolize school characters. Under this concern, how to cultivate aesthetic citizen challenges academic affairs in each university. Museum visiting is popularly used as course assignments or part of teaching and learning requirement.

In National Taiwan Normal University, “Arts and Aesthetics” is required at least 2 credits (two hours per week) for each students. But how does students look upon museum visiting? How are museum visiting related to their leanings?

Literature Review
In 1999, Fleming suggests a psychological barrier preventing young adults attending museums, claiming that it is caused by the notion of “threshold fear”, which dissuades people from entering spaces where they feel uncomfortable. Following, Mokhtar,& Kasim (2011) used a questionnaire survey to understand young adults’ motivations for visiting and not visiting museums. The findings indicate that youth within the study context has higher predisposition to visit museums and could be a potential sub segment to target when marketing museums to young adults. In addition, a majority of them has an overall positive image of museums, thereby contrasting the theory that young adults tend to see museums as boring, didactic and unapproachable. They also highlight that among respondents who have never visited museums in the last three years, the main reason for not visiting was the lack of time, followed by lack of interest in museum, and lack of information about the museum offerings. Other reasons for not visiting museum include the preference for other activities, difficulties in getting required information about museums and the tendency to put off visiting until a later date and the perception that museum admission fees are too pricy. A very small percentage of the respondents simply indicated that they do not like to visit museum.

Except these findings, past experiences of museum visiting from childhood also have been identified as a significant preventative of museum attendance among young adults. Negative memories of museums such as having to fill out boring worksheets at enforced school visits may cause them to associate museums strictly with education, not entertainment (Kelly, 2009). Another significant barrier preventing young adults attending museums as identified by
a variety of scholars is the lack of relevance to their needs and wants (Shrapnel, 2012).

In all, knowing young adults’ museum visiting habit, feeling and value become important issues in museum studies.

**Research Questions and Purposes**

This research project is intended to study perceptions, attitudes and behaviours of a sample of university students towards museum and museum visits. Our aim is to offer some suggestions to improve communication among students, universities, and museums.

**Research Method and Subjects**

Attitude research is an important issue for social psychology. How people form their evaluation of an attitude object becomes an important topic in attitude formation field. While a vast amount of empirical work and a high degree of theoretical elaboration have been devoted to the topic of attitude concept, attitude functions, attitude measurement, and attitude-behavior relationship, etc., social psychology is comparatively silent on the question of where likes and dislikes of (Chang, 2008).

A total of 348 National Taiwan Normal University students were investigated based on a 5 scales questionnaire with 31 questions\(^{22}\). 62.6% were female and 37.4% were male. Data collected from general education classes with a variety of majors in 2013.

<table>
<thead>
<tr>
<th>Major type</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>67</td>
</tr>
<tr>
<td>(Psy/Social)</td>
<td></td>
</tr>
<tr>
<td>Literature</td>
<td>159</td>
</tr>
<tr>
<td>Art</td>
<td>15</td>
</tr>
<tr>
<td>Others(Business etc.)</td>
<td>107</td>
</tr>
<tr>
<td>N</td>
<td>348</td>
</tr>
</tbody>
</table>

The questionnaire covers three parts. The first one is about past experiences in museum. The second one is about recent visit and future visiting plans. The last part is about basic information of the interviewees.

The inquired questions as: I see myself as…; How much artistic education have you received at school? How much artistic education have you received out of school? Up until now, how often have you visited museums, exhibitions, archaeological sites, etc. and in which way? Indicate up to 3 of the museums (or exhibitions, archaeological sites, etc.) that you remember best among those you’ve visited, and indicate briefly why these were so memorable. During your visits to museums or to exhibitions, how often have you participated in the following activities? How often have you visited a museum, exhibition, etc. in the past 12 months? What kind of museum, exhibition, etc. was it? In general, how satisfied have you been with your visit(s) to these, over the past 12 months? How much have you learned from the visit(s) taken over the past 12 months? Which of the following reasons motivated you to visit museums or exhibitions in the past 12 months? Which of the following did you feel during any visits to museums or exhibitions in the past 12 months? If you haven’t visited any museum or exhibition in the past 12 months, what were the reasons? For each of the following statements about the museum visits, please indicate how much you agree or disagree, using the scale below; How eager are you to visit a museum in the next 6 months? If yes, what kind of museum or exhibition would you like to visit? If you were to visit a museum or an exhibition in the next 6 months, which of the following emotions do you expect to feel? Do you think that, in the education of a teacher, the museum visit is useful?

Except visiting information, the interviewee’s and his/her parent’s education background, occupation status, study majors, working experiences were asked to respond.

For data analysis, these questions were categorized into three sects as “Habits”, “Feeling” and “Value” to interpret their perceptions, attitudes and behaviours when encountering museum setting. Habitual behavior that goes unnoticed in persons exhibiting it. Habit sect examines students’ museum visiting frequency, the types of museum and what they usually do when visiting. Feeling sect is reserved for the subjective experience of emotion. Value is about subject belief. Here we check how students think about museum existence, functions or what museum "ought" to be.

**Results**

**Subjects’ Descriptions**

These interviewed students self-identify as “open to new experiences, complex”(78.2% combining agree little, agree moderately, and strongly), “sympathetic, warm”(71.9%), “dependable, self-disciplined”(67.8%), “reserved, quiet”(63.5%) and “anxious, easily upset”(58.7%), but also “extroverted, enthusiastic”(58.5%).

Even though arts courses are required for each student from primary to high school, when asking how much artistic education have you received at school, 35.4% of the students responded “a little bit”, 35.4% said “some”, 20.7% with “moderate” and 7.8% as “extensive”. On the other hand, when it comes to artistic education out of school, 15.2% of the students responded that they had no experience, and the others said they had some experiences.

**Habits**

In the past 12 months, 70% of the students visited museums or exhibitions at least 2-3 times. 46.7% of arts major students visited more than 5 times that was

\(^{22}\) The questionnaire was developed by Prof. Stefano Mastandrea’s museum project team from Tre University Italy. The data collected here also joining the discussion with this cross-cultural investigation project.
significantly more often than other majors. On the other hand, when asking why they did not go to museum, more than 70% of the students responds they are lacking of time. When visiting museum, exhibitions, archaeological sites, they usually went with schoolteachers, friends, or parents. The most important reasons that motivated students to visit museums or exhibitions were “the pleasure I feel during the visit”, “the interest for the artist, the scientist, the exhibition”, and “the desire for cultural enrichment”, respectively. They sometimes participated in “multimedia activities”(44.4%), “guided tours”(41.1%), “responding to questionnaires”(37.2%), and more often likely to “graphic and pictorial activities”(with 31.8%). When asking why they did not going to museum, more than 80% of the responses are lacking of time.

Feelings
During the visits, students feel “fun”(89.5%), “well being”(85.2%), and less commonly, “distress”(2.45) and “boredom”(3.2%). Students tend to have positive felling with museum settings or related activities. In general, 61.3% of the students were satisfied with their visiting experiences. During the visit, most of the students experienced positive feelings such as “aesthetic enjoyment”(65.7%), “pleasure”(60.0%), “curiosity”(58.2%), “well being”(51.3%), and “wonder”(49.1%). They also expressed that they do learn from the visiting. 37.2% said they learned some, 29.3% said much, and 4.4% said very much.

Values
When asking about the value of the museums, more than 50% of the students agree with “as a place of learning, museums provide a valuable contribution to knowledge”, “attending museums can develop an open mind”, “my faculty should encourage more the attendance at museums”, and “admiring what is exhibited in a museum produces a feeling of well-being”. As to the future visiting, 34.2% of the students somewhat eager to visit a museum, and 45.5% of the students would like to go. The types of museums that students would like to visit most are “modern and contemporary”, “archaeological site or archaeological museum”, “architecture, design, and fashion”, and “ancient art”. When asking why they did not going to museum, More than 80% of the students think museum visits are somewhat useful to teacher education, but only 29.7% of the students think it is very useful, and 10.6% express that it is very useful. Their values about museum visiting and teacher education is not as positive as other countries in this respect (24.6% of Italy students, 27.7% of Austria students, 29.5% Hungry students and 45.2% of Portugal students said it was very useful).

Conclusion
These findings indicate how attitude formation is related to conditioned experiences. Taiwanese young adults’ attitudes toward museum visiting show a positively circulating cycle between self-identity, habits, and values. The results of the survey have shown that young adults students average aged 20 years old think that museums visiting are full of fun, aesthetic enjoyment and learning experiences. However, from the survey results, we found there are several reasons stopping them from attending museums. One of the reasons is lacking of time. The other one is to do with the type of the museum. They like to see and experience something new, modern and contemporary. As Shrapnel (2012) indicates Young adults want to see and experience something new, unique and entertaining. Therefore, museum type should take into concerns when organizing a museum trip for class teaching. The results also shows that when students attend museum, most often with school teachers. It means museum visiting is for schooling instead of their social life. If we expect students to be a life long learner and best using museum as rich learning sites in the future, then there are still ways to work on.

On the other hand, we also find there is a discrepancy between the values of the museum experience itself and the experience in the context of teacher education. All in all, this study uncovers meaningful information for museum education to be enhanced in Taiwan.

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References
The Role of Facial Features in the Identification of Comics Characters

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Abstract
Humans are great at face discrimination. However, such proficiency does not seem to apply to pictorial faces. In this study we are interested in comparing our perception of cartoon faces to that of real faces. The results show that: (1) Similar to the condition for recognizing real faces, hair, eyes, and mouth are the most critical features for comics face identification. (2) The absence of eyebrows doesn’t affect response accuracy and reaction time for face identification. (3) The absence of nose reduces the reaction time for comics face identification. Overall, there are similarities and differences between identification of real and cartoon faces. Some of the differences might be attributed to information loss by the schematic rendering of comics facial features.

Keywords: Facial feature; face identification; face recognition; comics.

Introduction
People have an uncanny ability to perceive and recognize faces. Our ability to easily identify other people and assess their emotion, gender, race, and age is dependent on facial perception and facial recognition (e.g., Corenblum & Meissner, 2005; Yang & Shyi, 2010). Real faces often differ from one another in very subtle ways. A slight variation in either the shape of facial features or the configuration of features can lead to a very different feel about the identity of the owner of the face. The face recognition mechanism of human observers must have developed some ultra-sensitivity to minute variations in facial features and their spatial configurations.

Pictorial faces, such as that of comics characters, are not as stable as real faces in both the shape and the configuration of facial features across different shots. From the perspective of the cartoonist, it is very challenging to create assorted faces of high consistency and distinction within a highly constrained feature space as in the case of faces. As a result, many comics fans complained that they often find it very difficult to identify some cartoon faces. A cartoonist who created too many similar faces of characters would be coined by the readers as “hankoe”—the clone creators. Some cartoonists indeed taunted themselves in this regard on public forums. Adachi (2000/2006) sneered at himself that all faces of characters he drew resembled one another. Toriyama (1980/2009a, 1980/2009b) and Hojo (1991/2006) also ridicule themselves in their works. All female characters had the same face, and they could be any female in disguise.

However, being able to discriminate one cartoon face from another is extremely important for comics readers. If readers have mistaken a character for someone else, they may not understand and enjoy the plot (Lee, 2012). We are interested in the differences between the identification of cartoon and real faces. While cartoon and real faces differ greatly in consistency on the local features and the global configurations, we are focusing on the former in this study.

Method
Participants
Participants were recruited at a university in Taiwan by opportunity sampling, and the majority were students. There were 51 participants in total with 24 females and 27 males (mean age = 23.2 years, SD = 4.2, range = 19-40 years). The average time interval of reading comics was 173.9 days (SD = 279.7, range = 1-720 days) recently, and 12.8 days (SD = 36.2, range = 1-180 days) in the past. All participants had normal or corrected vision.

Materials
We employed a cartoonist with 7 years of relevant experiences. She created an original comics work for our experiment (Figure 1). The original work had 60 pages in black and white. The story was easy to understand in a short time. All pages were 548 x 768 pixels & 600 ppi in size, making it comfortable for reading.

There were six characters in the story: three girls and three boys. They looked very similar, only differing in internal facial features (i.e., eyebrows, eyes, nose, and mouth). This was done to avoid ceiling effects in the participants’ identification performance due to potential reliance on other external facial features (e.g., hair, full head outline, and apparel). The appearing times of the six characters was controlled to be roughly equal. The average appearance times in panels were 50.7 (SD = 3.882, range = 44-54).

All test images in the experiment were 600 x 600 pixels & 600 ppi in size. All images were extracted from the manga and efforts were made to select full-frontal depictions which displayed all facial features clearly. Textual elements were eliminated from the images. The viewing distance was approximately 45 cm. The experiment was conducted in a room with low ambient illumination.
Procedure

Stimuli were presented on a 1024 x 768 pixel white background and displayed on a 24” EIZO FlexScan S2433W LCD monitor with a refresh rate of 60 Hz. Presentation of stimuli was controlled by COGSCIdotNL OpenSesame software, version 0.26, developed by Mathôt, Schreij, and Theeuwes (2012). The participants were required to read the original comics work on a computer screen. The full comprehension of the story was stressed so that the participants must learn to recognize all characters. In the following face identification task, the participants were requested to identify the face shown on the screen by pushing one of the six buttons. The interstimulus interval was 750 ms. The response accuracy and reaction time were collected (Figure 2).

Analysis

The response accuracy and reaction time were collected, and only data from correct trials were analyzed. We also screened the data by the accuracy threshold (58.3%), which was the midpoint between chance level (one-sixth) and 100% accuracy.
Results
Comparing the results of FF with FWH, we found the absence of hair significantly reduced participants' ability to identify the faces. The accuracy was significantly reduced ($t(32) = 3.524, p = .001$), and the reaction time was significantly extended ($t(32) = -2.462, p = .019$) (Figure 4).

Since we were interested in the relative contribution of each internal feature to face identification, the dominant external feature such as hair should be eliminated. As a result, the FWH group would be taken as the control, to which all other FMF data were to be compared. The comparisons between FWH and various FMF’s are shown in Figure 5. The absence of eyebrows did not affect participants' ability to identify the faces. However, the lack of eyes significantly reduced participants' performance levels. The accuracy was significantly reduced ($t(32) = 3.655, p = .001$), but the reaction time was not affected. Furthermore, the accuracy was not significantly different between FWH and the absence of nose, but the reaction time was significantly shortened ($t(32) = 3.471, p = .002$). Finally, the lack of mouth significantly reduced participants' ability to identify the faces. The accuracy was significantly reduced ($t(32) = 2.277, p = .030$), but the reaction time was not affected.

Discussion
Feature Processing
Hair Hair plays an imperative role in the identification of faces. Czigler (1985) found the reaction time of face recognition was shorter in the hair stimulus condition than in the eye stimulus condition. He presumed that hair was simpler and more apparent than eyes. Chan & Ryan (2012) indicated that face recognition was impaired when changes were made to external facial features, even when all internal features remained the same. Toseeb, Keeble, and Bryant (2012) pointed out that hair frequently changed in different situations (e.g., the angles of perspectives, and the changes of

Figure 4: Averaged data from our experiment assessing the contribution of FF and FWH to the identification of faces.

Figure 5: Averaged data from our experiment assessing the contribution of FWH and FMF to the identification of faces.  
Note. * $p < .05$.
hairstyle in real life). It deeply interfered the accuracy of face recognition. Consistent with previous reports, the absence of hair significantly reduced participants' ability to identify cartoon faces. They spent more time reading faces, but still mistook a character for someone else frequently.

It may be the case that a large proportion of a cartoon face is taken by hair, and that the hair of comics character hardly changes at all. Therefore readers can easily recognize and remember a character by his/her hair. Furthermore, it might be significantly easier for the cartoonist to draw a character’s hair in a more consistent way than it is for other facial features. Cartoonists need great skill to keep consistency in rendering internal features in every panel. In summary, like the case in real face identification, hair is the most important feature in face identification of comics characters.

**Eyes** Among the internal features, we found that eyes are the most critical feature for comics face identification. The absence of eyes reduced participants' ability to identify faces. Consistent with previous findings in human faces, recognition was worse for images lacking eyes than other internal features (e.g., Walden & Field, 1982; Fraser, Craig, & Parker, 1990; Haig, 1986; Zhuo, 1995). If cartoonists bring more individual differences to the eyes of his/her characters, it could help readers to differentiate comics characters more easily.

**Mouth** We found that mouth was also very important for comics face identification. The lack of mouth reduced participants' ability to identify faces. Previous studies of human face recognition exploring the significance of different facial features for the task of recognition have typically proposed a hierarchy with the eyes being the most important features, followed by the mouth (e.g., Fraser et al., 1990; Haig, 1986). Comics face identification is similar to that of real faces in this department.

**Eyebrows** Surprisingly, the absence of eyebrows did not cause any decline in the participants' ability to identify faces. There were relatively few studies examining the contributions of eyebrows in their experiments (e.g., Haig 1986; Maruyama, Masame, & Endo, 1988). According to Laughery, Alexander, & Lane (1971), eyebrows were not among the facial features which participants used to identify faces.

However, Sadr, Jarudi, & Sinha (2003) found the absence of eyebrows caused an even greater decline than the eyes missing condition in the participants' ability to recognize familiar faces. They argued that eyebrows appeared to be very important for conveying emotions and other nonverbal signals. Eyebrows might serve as very 'stable' facial features. Because they tended to be of relatively high-contrast and significant in size, eyebrows could survive substantial image degradations. Moreover, since eyebrows sat atop a convexity, as compared to some other parts of the face, they might be less susceptible to shadow and illumination changes. Finally, while for a given face the eyebrows might be considered a sturdy and consistent facial feature in these respects, the eyebrows were equally attractive as a salient and informative characteristics for facial identification owing to their great diversity of appearance across different faces.

In addition, in the interview with the participants after the experiment suggests that while eyebrows might not be important for comics character identification, they are very functional in delivering emotions of comics characters. As expressed by Groenste (2003/2008), not only do the height, thickness, and upward-slanting angle of eyebrows index emotions of comics characters, but they also lead to more vivid and attractive visual effects.

**Nose** Still more surprisingly, the absence of nose did not reduce the participants' ability to recognize comics faces. By contrast, the nose was found to be a critical internal feature for human face recognition (e.g., Fraser et al 1990; Davies, Ellis, & Shepherd, 1977; Haig, 1986; Laughery et al., 1971). The shape of nose varies more than do other internal facial features with different face angles. Perhaps noses are not easy to draw, and have been drawn too schematically in Japanese Manga It will be interesting to use western style comics faces to check if there is any difference in the role of nose.

The most interesting thing about nose is that we found the absence of nose significantly reduces the reaction time for comics face identification. The results suggest that in our sample of comics faces, noses are more like noise than signal for face identification. It is not clear at this moment to decide whether nose-as-noise is general to all pictorial faces, or is a local phenomenon specific to Japanese Manga style. Again, the use of face stimuli of greater variety is in order to settle this puzzle.

**Other Factors in Identity Discrimination**

Overall, there are similarities and differences between identification of real and cartoon faces. Some of the differences might be attributed to information loss by the schematic rendering of comics facial features. It is possible that we apply the same perceptual analysis to cartoon and real faces. The poorer face identification performance for the cartoon faces is simply due to the fact that comics faces are impoverished versions of real faces. It probably affects the character identification through the configuration processing or the holistic processing. It is also possible that we treat cartoon and real faces as two completely different stimulus categories and have developed different modes of processing for each type. More studies are needed to resolve this issue.

**Acknowledgments**

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The Golden Section Hypothesis: Cropping Abstract Artworks

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Abstract

Research using Fechner’s method of production has typically yielded outline rectangles that share little with stimuli (e.g., artworks) normally discussed in the context of the GSH or with the materials studied with Fechner’s method of use. To draw Fechner’s two methods of investigation closer together, 47 undergraduates were asked to crop either 15 abstract nonrepresentational artworks or 15 matching colored rectangles as if they were planning to frame them for wall displays. Results showed that the mean short side/long side ratios for the artworks (M = 1: 1.59) and colored rectangles (M = 1: 2.62) were significantly different (F(1, 45) = 8.89, p = .005), with only the mean ratio for the artworks approaching the golden ratio.

Keywords: Golden section hypothesis, method of production

A modification of the Fechner’s method of production was used to investigate the golden section hypothesis (GSH). Previous research with the method of production has typically yielded simple, line drawings of rectangular shapes. Unfortunately, these simple shapes seem to share little with the types of elaborate stimuli, such as paintings, sculptures and buildings, normally discussed in the broader context of the GSH or with the types of stimuli traditionally studied with Fechner’s method of use. Westphal-Fitch, Oh, and Fitch (2013) commented that one advantage of the method of production “is that the outcome can be appropriately summarized in a single number: the width/height ratio (p. 13). However, they go on to note that findings from such studies are inconsistent. For example, Fechner (1876) provided participants with one side of a rectangle and asked them to draw the other three sides, and he felt that his findings supported the GSH. Hoge (1997) conducted a study attempting to very carefully replicate Fechner’s original work with the method of production, but the results did not support the GSH. Such inconsistencies exist in spite of the suggestion from Russell (2000) that the method of production “may be less susceptible to spurious, artificial golden-section effects than the more common method of choice” (p. 1417). Russell noted many methodological problems inherent in the method of choice.

Fechner’s method of use has been studied using a variety of stimulus materials. Shortess, Clarke and Shannon (1997) attempted to replicate Fechner’s original study with the method of use with high art, but also included popular art, artist materials such as pre-stretched canvases and watercolor pads, custom-made frames, typing paper and other products of modern culture, but found consistent support for the platinum ratio of 1: 1.33 rather than the golden ratio of 1 to 1.62. Russell (2000) found some additional evidence for the platinum ratio under certain conditions studying a set of portrait and landscape paintings.

To draw Fechner’s methods of use and production closer together, we asked participants to produce rectangular stimuli that possessed more internal complexity than the typical line drawing of a rectangle. In essence the procedure involved the cropping of stimuli. McManus et al. (2011) have suggested that cropping “is an ideal paradigm for experimental aesthetics, allowing precise experimental control with Fechner’s Method of Production, a technique which normally is not easy to use” (p. 332). Cropping is a major part of the photographic process.

Russell (2000) investigated the effects of context with the method of production by instructing participants to produce four-sided shapes through manipulation of sheets of paper on a table. Two of the instruction conditions emphasized that the resulting four-sided shapes should be pleasing for either a landscape painting or a portrait. The results confirmed his hypothesis that the proportions for the landscape and portrait conditions would differ.

Westphal-Fitch, Oh, and Fitch (2013) used computer-generated images projected on a wall to study the method of production. Participants used a wireless computer mouse to change the shape of the projected rectangle. The white image began as a small 5 x 5 pixel starting point on a black wall and could be increased in size by moving the mouse. Context was provided by a gray frame projected on the wall. The results showed that the frame contexts did influence the proportions of the images the participants produced.

The present study combined aspects of the work of McManus et al. (2011) and Westphal-Fitch, Oh, and Fitch (2013) by asking participants crop either a series of abstract artworks or colored rectangles as if they were planning to frame the works for wall displays. That is, the participant produced the final proportions of the artworks. Unlike
Westphal-Fitch, Oh, and Fitch (2013) the present stimuli started out large and were then reduced in size. Unlike McManus et al. (2011) the present stimuli were explicitly developed to avoid content characteristics that could inhibit cropping of certain features.

We began by developing a set of abstract art works for use in the cropping study.

**Study 1: Developing Stimuli**

Six art instructors were individually asked to produce a series of nonrepresentational art works using Microsoft Paint that conformed to the following criteria: no recognizable subject matter, no definitive sense of symmetry, no central focus, no attempt to show depth cues, and no solitary simple geometric shapes. They were instructed that they could use a variety of colors and textures as well as all of the tools (e.g., paintbrush, pencil, spray paint, etc.) available in Microsoft Paint. The resulting 66 art works were then judged by undergraduates to determine how well the criteria were met.

**Method**

**Participants.** Sixteen volunteers from a general psychology course at a midsize state university viewed the art works. There were 8 women and 8 men, and the mean age was 19.81. There were two sessions with ten and six individuals.

**Procedures.** The art works were projected on to a large screen in a college classroom. Following detailed instructions including specific examples the participants judged each art work for the presence and location of symmetry, depth cues, central focus, and recognizable objects. There were two practice trials and then the 66 art works were presented for 20 seconds each.

**Results**

When the participants’ judgments of the presence and location of any of the characteristics noted above showed even moderate agreement we eliminated that art work. These strict criteria resulted in the elimination of 51 art works and produced the final set of 15 art works.

**Study 2: Cropping Art Works**

**Method**

**Stimuli.** The 15 art works that were selected using the procedures described above were rear projected onto a large 96 in. by 72 in. (2.4 m x 1.8 m) rear-projection screen in a research laboratory. All stimuli were rectangular, horizontally-oriented, and had initial dimensions of approximately 62 in. by 50 in. (1.6 x 1.3 m). In addition, blank versions of the 15 artworks matched for dominant background colors and initial dimensions were used.

**Participants.** Forty-seven volunteers from a general psychology course at a midsize state university participated in the study for extra course credit. There were 39 women and 8 men, and the mean age was 19.26. Participants were randomly assigned such that 23 viewed the abstract art works and 24 viewed the blank rectangles.

**Procedures.** Participants were tested individually and were seated in front of the rear projection screen with resulting visual angles that did not exceed 39 degrees. Using a wireless computer mouse, they were asked to crop the stimuli as if they were planning to frame them for wall displays. The cropping procedure actually involved painting over parts of the stimuli with black rectangles. However, it gave the clear impression that parts of the original stimulus had been removed or cropped. The projected images were from Microsoft Paint files, and each cropped image for each participant was saved as a file for later measurement and data analysis. The participants were responsible for producing the final proportions of the cropped images. Although the cropped images had to be rectangular, in all other respects they were at the discretion of the participants. The stimuli were presented in a different random order for each participant.

**Results**

The upper left and lower right pixel locations for each resulting art work or colored rectangle were recorded. Those coordinates were used to determine both the proportions and the areas of the cropped images. For proportions, the repeated measures analysis of variance for the 15 stimuli failed to reach significance \((F(14, 630) = 1.14)\) as did the interaction between the 15 stimuli and stimulus type (art works or blank rectangles) \((F(14, 630) = 0.97)\). However, the analyses showed that the mean short side/long side ratios for the 15 artworks \((M = 1: 1.59)\) and the matched 15 blank rectangles \((M = 1: 2.62)\) differed \((F(1, 45) = 8.89, p = .005)\), with only the mean ratio for the artworks approaching the golden ratio. Figure 1 shows the mean long side/short side ratios for the art works and blank rectangles and illustrates both the consistency of ratios for the art works compared to the blank rectangles as well as the close correspondence of the mean ratios for the art works to the golden ratio.

![Figure 1: Long side/short side ratios for art works and blank rectangles.](image-url)
The cropped blank rectangles were clearly rather elongated when compared to the art works, and there appears to be little consistency across the 15 stimuli in the participants' responses.

For areas, the repeated measures analysis of variance for the 15 stimuli was statistically significant, \( F(14, 630) = 9.92, p < .001 \), but the interaction between the 15 stimuli and stimulus type (art works or blank rectangles) was not, \( F(14, 630) = 1.65 \). Figure 2 includes the mean areas for the artworks and blank rectangles and shows that the area main effect was primarily due to stimuli 13 and 14. It also shows that the consistency of differences in areas for the two types of stimuli, since in all cases the mean area for the artwork was greater than the mean area for its match colored rectangle. The differences in the mean areas of the artworks and blank rectangles (\( F(1, 45) = 21.279, p < .001 \)) did reach significance and supports the conclusion that the two types of stimuli were responded to very differently. The areas of the artworks were on average 1.45 times larger than those of the blank rectangles. The mean area for the art works was 161307.26 pixels\(^2\) while the mean area for the blank rectangles was 111568.81 pixels\(^2\).

**Figure 2:** Areas (in pixels\(^2\)) for art works and blank rectangles.

**Discussion**

The findings suggest that one of the reasons for inconsistencies in extant studies of the golden section hypothesis across different methodologies may well be the inherent differences in the types of stimuli used. The present abstract art works (or stimuli with aesthetic internal structure) led to both different long side/short side ratios and different areas. The abstract art works were cropped in such a manner that they more closely and more consistently conformed to the golden ratio. The elongated blank rectangles, on the other hand, did not conform to the golden ratio and there was considerable variation in the mean long side/short side ratios. The abstract art works more closely resemble the types of stimuli encountered in real world aesthetic experiences. As Konecni (2005) noted the main problem with empirical studies of the golden section hypothesis is that such studies involve non-artistic stimuli presented without an aesthetic context. The present study used aesthetic stimuli made by art instructors, and asked the participants to crop those art works as if they would be displayed in their homes.

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**References**


More than the Sum of its Parts: Perceiving Complexity in the Visual Arts

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Abstract

In the 1960s and 1970s Daniel Berlyne suggested that interest and preference, as expressions for aesthetic experience, mainly depend on the complexity of the perceived image. In the following decades complexity has repeatedly been shown to be influential in the experience of visual art, to such a degree as intermediately complex artworks are preferred over highly complex or very simple ones, because they neither challenge the beholders too much, nor bore them.

Interestingly, the definition of complexity used in existing studies is mostly bound to formal criteria of the perceived artwork, such as the number of elements that form a scene, their heterogeneity, or the irregularity of the depicted forms. This perspective, however, ignores the conceptual or iconographical complexity behind the formal structure. The cognition of the underlying conceptual, content related aspects of a painting is crucial for the process of aesthetic perception and valuation of a painting.

The decoding process, which takes place when we infer meaning from a visual representation, is highly dependent on individual characteristics, such as the familiarity with a certain style or the level of knowledge about the depicted content. In line with this argument we would expect that art experts perceive complexity in paintings in a different way than lays.

In our study we address two central questions: First, to what extent is perceived complexity dependent on conceptual aspects of the painting? And second, how do lays and experts differ in their complexity ratings? We asked ten art historians with a minimum of two years working experience (either in art historical research or art education) and 20 lays with minimum or no knowledge about art to rate 90 artworks on different scales referring to formal and content related complexity.

Our results show that content related factors of an artwork indeed significantly predict complexity ratings for art experts as well as for lays. Moreover, we find that perception time matters. While spontaneous complexity ratings mostly depend on formal criteria, the importance of content raises if the examination time is extended. Regarding the effect of expertise on the perceived complexity our results show that experts differ significantly from lays only in spontaneous evaluations.

Keywords: complexity, art
The Blush in Fiction and Psychological Research

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Abstract
My paper compares how the fleeting blush is thought of and used in art and science. The focus is on literary fiction not only because the transient, involuntary and uncontrollable nature of the blush presents difficulties for the visual arts and for drama but also because it features so frequently in fiction and has been the subject of critical discussion. I identify themes in this discussion, summarize findings from content analysis of episodes from works of fiction, and compare these themes with accounts in the psychology of blushing.

Keywords: blushing; psychology; fiction; Jane Austen.

Introduction
The blush remains a puzzle in the psychology of emotion and has attracted much less attention than other facial expressions despite its significance as a distinctively human response and the voluminous literature on ‘self-conscious’ emotions related to the blush such as shame and embarrassment (Tangney & Fischer, 1995; Tracy & Robins, 2004). Yet the blush was of widespread interest long before Darwin’s The Expression of the Emotions in Man and Animals (1872/1998) brought it into the scientific domain and there exists a substantial literature on how authors make use of its narrative possibilities (Gay, 1979; Halsey, 2006; Mullan, 2012; O’Farrell, 1997; Ricks, 1976; Yeazell, 1991). Literature provides a rich source of insight for the study of emotion more generally (Hogan, 2010; Oatley, 2012); I consider what might be learnt about the blush from analysis of Jane Austen’s novels. Blushing has figured significantly in this work: ‘if the heroines of these novels exhibit a marked affinity for blushing, blushing has a marked affinity for narrative’ (Yeazell, 1991, p. 77).

My reading of the literature on blushes in Austen’s work identifies three themes: the blush has no single meaning; it is a sign of modesty; it is essentially sexual. The first theme proposes that the blush has no single interpretation and the ambiguity that ensues from this is used by Austen for narrative purposes. Thus, her characters notice but misinterpret blushes or lack the insight into the cause of a blush which the narrator has provided to the reader; the author misleads the reader about the cause of a blush or withholds from the reader relevant knowledge that a character has. A blush is used for artistic purposes, not simply for description, and its effectiveness draws upon readers’ common sense understanding of blushes and their various causes. Halsey (2006) noted the causes of facial reddening explicitly mentioned by Jane Austen: anger, astonishment, surprise, displeasure, cheerfulness, confusion, receiving praise, agitation, indignation, consciousness, guilt and shame.

A second theme is modesty, which played an important role in courtship in the polite society of late-eighteenth century England that provides the setting for Austen’s novels. Marriage was a crucial institution in that era because of its significant economic implications for women and the difficulties of divorce and it was incumbent on women—who were expected to adopt the more passive role in courtship—to make the correct choice of husband, who necessitated having opportunities to meet potential partners in mixed company while at the same time maintaining an unblemished reputation. Modesty afforded her protection from the ribaldry of men who were expected to adjust their behaviour in her company in order to respect her virtue and prevent her from being sullied by any indiscretions she might accidentally encounter. Modesty was also considered to make a woman more attractive to potential husbands, not only because of the good reputation she would bring to the marriage but also because of the erotic promise: sexual feeling restrained is more arousing than sexuality openly displayed; as Yeazell puts it (1991), modesty is an ‘erotic double agent...her very resistance serves to entice man as well as to restrain him’ (p. 22); the blush is ‘modesty’s other face—the implicit promise of the ardent surrender’ (p. 74) On the other hand, the reserve and bashfulness associated with a modest demeanor are undesirable in a man since they restrict his capacity to take the initiative in courtship and to defend the woman’s interests in the future. Thus, modesty is a quality particularly identified with women and the blush as the expression of modesty is also eroticized and gendered: ‘blushing is the realm of the female’ (Wiltshire, 1992, p. 79).

The third theme has already been alluded to, the sexual nature of the blush, a view that is widespread in literary criticism. This goes beyond recognition that the blush is involved in courtship to claim that it reveals a woman’s sexual desire (Wiltshire 1992, p. 18) and is used by Austen to indicate sexual attraction between characters (Gay, 1979, p. 18). O’Farrell (1997, p. 2) writes of the dual nature of the blush as ‘the line of pleasure and the line of moral obligation’, pleasure not simply in that the blush can be enjoyable as well as painful but also because it has an erotic charge.

Before discussing these themes and their relation to psychological accounts of the circumstances of blushing I examine a single novel in order to gain insight into Austen’s use of the blush, to introduce examples of particular interest.
and to consider the extent to which it reflects the themes I have identified. I have selected Northanger Abbey, first published in 1818, whose heroine, Catherine Morland, has been described as ‘the most innocent blusher in Austen’s fiction’ (Mullan, 2012, p. 266).

**Blushes in Northanger Abbey**

The word search facility of an e-book edition of Jane Austen’s novel was used to locate all mentions of words with the root ‘blush’ (blushing, blushed, and so on) and words that can be synonyms for blushing such as flushing, colouring, glowing, reddening and references to cheeks, complexion and skin. The surrounding text was read to gain an understanding of their context and record any mentions of relevant emotions.

Eighteen explicit mentions of blushing were identified, in fifteen of which the reference is to a character actually blushing while two refer to hypothetical blushes. The remaining instance is less clear cut: Henry (Catherine’s suitor) ‘blushes for the narrow minded counsel he was obliged to expose’ but is not clear whether Austen means that Henry actually blushed during the meeting he is recalling or this is a metonym for the difficulty he experienced at the time.

The situations that involve explicit references to blushing are similar to circumstances that are described in psychological surveys of blushing (Leary, Britt, Cutlip, & Templeton, 1992), including being the centre of attention, receiving a compliment, interacting with an attractive member of the opposite sex, asking a foolish question, blushing because one has blushed, blushing for someone else. For example, Catherine blushes while dancing when she realizes that she is being observed and whispered about by two men and becomes anxious about possible defects in her appearance. Similar circumstances are described as eliciting colouring (six occasions) and red, redder or blooming cheeks (three occasions). There are only five occasions where a blush-related emotion is explicitly mentioned in conjunction with a blush, namely shame (three instances), embarrassment (once) and mortification (once); it seems sufficient for Austen to describe the character as blushing. Other emotions mentioned are a blush of surprise, glowing cheek with happiness (two instances), and cheek flushed with hope. Catherine colours with resentment at having suffered an indignity and when she defends Eleanor against criticisms made by her mother of the friends she had made at Bath: ‘Catherine coloured as she warmly answered, ‘No friend can be better worth keeping than Eleanor’ (p. 224); ‘warmly’ might suggest indignation on Eleanor’s behalf.

There are no instances where the interpretation of a blush is ambiguous although during one conversation between Catherine and her friend Isabella Catherine mentions the possibility of Isabella becoming her sister (through Isabella’s engagement with Catherine’s brother James) and Isabella blushes because she has in mind their becoming sisters via her secret relationship with Henry’s brother Frederick. Catherine remains oblivious of this and Austen does not make explicit the reason for Isabella’s blush; readers must work this out for themselves.

There are only four explicit mentions of modesty in the book, none of which appears in the context of blushing. Yet modesty in the sense of a character’s concern with appropriate behaviour in the context of courtship, encounters with potential suitors and the anticipation and discussion of such encounters and suits is at the heart of the novel and such concerns represent the most frequent cause of blushing. Eleven occasions where an explicit blush is described are of this nature. For example, Catherine blushes when she is travelling in an open carriage and recalls Mr Allen’s remark that it was inappropriate for young men and women to travel together in such a fashion. Austen presents Catherine as very young and inexperienced in the ways of society and she is responsible for most of the explicit references to blushes in the book (sixteen out of eighteen.)

Sexual attraction is a cause of blushing and colouring. Catherine blushes when she suddenly sees Henry approaching and on another occasion when she discovers that the young woman accompanying him is his sister and not her rival. Receiving a compliment on physical attractiveness also elicits a blush, whether given by a woman friend or a male suitor. Another aspect of the sensual nature of the blush is the pleasure it can provide and while there are episodes in the novel where the blush is associated with unhappiness, for example when Catherine is snubbed at the doorstep by the Tilneys, it is not necessarily an unwelcome experience and can accompany pleasure and amusement in the company of others.

Two additional causes of the blush are of psychological interest. One is where Catherine does so when she is alone. The other is where characters blush in the context of the actual or potential revelation of a secret or when they gain sudden insight into the, often sexual, significance of some event. A key thread throughout the novel is Catherine’s vivid imagination fuelled by her reading of lurid Gothic fiction and she believes not only that Henry’s father might be responsible for his wife’s death but also that items of furniture in the guest bedroom she is occupying in his house have some hidden significance. She blushes ‘with surprise and shame’ when she discovers that a trunk contains merely a counterpane. As she struggles to open a chest she realizes that in her haste she has locked rather than unlocked it whereupon she blushes. On each occasion she is alone and unobserved yet she blushes, which appears inconsistent with the thesis that undesired social attention is the necessary and sufficient cause of the blush (Leary, et al., 1992). Catherine blushes when she becomes conscious of the foolishness of her behaviour. She is the judge of her own conduct but imagines how she might be seen. This suggests that we blush
when we reflect on our conduct in a self-conscious fashion, that is to say, we adopt an ‘other’ perspective of the self.

There are several instances of blushing because of a potential revelation. During her first conversation with Henry Catherine colours when he asks her what she is thinking and she responds ‘I was not thinking of anything.’ In fact, she had been entertaining critical thoughts about him. She blushes at her hidden motive for asking Eleanor Tilney about her late mother’s portrait. Catherine is unhappy at allowing Henry to read a letter she has received from her brother because it ends with a warning to Catherine to ‘beware how you give your heart;’ on a separate occasion she fears that expressing her feelings in a letter to Eleanor would cause her to blush if Henry were to read it. Isabella blushes at her interpretation of Catherine’s comment on their becoming sisters when her engagement to Frederick is a secret. In each case there is allusion or reference to something that the blusher would prefer not to become known and fears will be disclosed.

Discussion

There are frequent references to blushing, reddening and colouring in the novel. The prototypical blushing episode occurs during an interaction between two characters when some element of a sexual nature is present, whether this is the sexual attraction between them or a reference or allusion to romance or courtship. There is little evidence of the ambiguity of the blush although reddening and colouring do accompany emotions other than those typically associated with blushing. There are only four direct references to modesty, nevertheless it is a constant underlying theme, relating to compliments on appearance, consciousness of appropriate behaviour in the company of the opposite sex and self-consciousness during interaction with a member of the opposite sex to whom the character is attracted. The blush serves to illustrate character rather than make a significant contribution to the development of narrative. Thus Catherine’s blushes are brought about by naivety and social inexperience and awkwardness; Isabella’s blushes and colouring suggest her coquettish behaviour.

Austen’s emphasis on modesty and opposite-sex encounters may be thought to reflect the historical and social context of her novels, which focus on courtship and marriage in polite society, in particular as they impact upon women, and do not encompass the worlds of work or commerce, or the professions of politics, the judiciary, church and universities that were closed to women in that era. Furthermore, women were constrained in what they were permitted to say or even think about sexual matters. Nevertheless my analysis of the circumstances of blushing in fictional texts by seventeen novelists representing a range of historical periods found that fictional episodes were extremely likely to involve an encounter between members of the opposite sex (81 per cent of episodes) and there were significantly more sexual associations with to blushing in the sample of fiction than in participants’ questionnaire responses (25 per cent) (Crozier, 2012). This may reflect the fact that sexual issues are central to fiction in general and are not restricted to Austen’s period.

The relation of sex to the blush plays very little part in contemporary theorizing, which focuses on embarrassment as the cause of the blush and regards sexual encounters as likely triggers of embarrassment (Miller, 1996). Where the potential function of a blush as a social signal is concerned it is considered to be a signal of submission rather than a sexual one (Van Hooff, 2012). In contrast its sexual essence is asserted in psychoanalysis (Karch, 1971), drawing attention to the apparent similarity between the rush of blood to the face in the blush and to the sexual organs in states of sexual arousal. Ellis (1927, location 1630) claimed that ‘the sexual relationships of blushing are unquestionable. It occurs chiefly in women... its most common occasion is some more or less sexual suggestion.’ Ellis considered the blush to be the physiological basis of modesty which he discussed in terms of societal norms concerning nakedness, arguing that shame and the blush are means of enforcing compliance with these norms and rules: in his words, ‘the blush is the sanction of modesty.’ Nevertheless modesty too has been neglected in the psychology of emotion and where it is discussed it tends to be in the context of social predicaments that cause embarrassment.

Austen is not the only writer to propose that we blush when we are alone. The notion of an ‘other perspective of the self’ is an established one, advocated, for example by Mandeville (1732/1988) and more recently by the philosophers Taylor (1985) and O’Brien (2011). Is self-consciousness in this sense necessary and sufficient for a blush? One can ask too whether it is necessary for a blush that the judgment should be an adverse one, as it is in Catherine’s case where she realizes the foolishness of her motives and actions. Will she blush if she judges herself adversely even if the judgment made from the observer perspective is not a negative one or if she imagines that her behaviour constitutes grounds for being judged adversely by others even if she does not share that judgment? The latter is an example of what Castelfranchi and Poggi (1990) term ‘shame before the other’ which they regard as necessary for a blush. Taylor (1985) proposed one answer to these questions, arguing that the judgment in shame is ultimately the blusher’s own even though the audience enters into it. These are issues worthy of further examination.

Conclusions

The potential ambiguity of perceived colouring, modesty and the sexual dimension have been identified in Austen’s use of the blush in fiction and the latter two figure in analysis of Northanger Abbey. Circumstances surrounding the blush in the novel are readily understood in terms of contemporary accounts of blushing nevertheless literary accounts draw
attention to issues that have been neglected in psychological theorizing. The ambiguity of the blush has implications for research, suggesting that we should study reddening more generally rather than undertake studies whose design is guided by reliance on the connection in the everyday lexicon between embarrassment and the blush. Why the blush occurs so frequently during sexually charged encounters in fiction is also worthy of further investigation. Does current research give too little emphasis to this dimension of the blush? Analysis of literary texts suggests circumstances of blushing that have the potential to yield insights into its nature, particularly the experience of doing so while alone and the role of sudden revelation of matters that the blusher would prefer to be kept secret. Literary and psychological analyses can complement one another in advancing understanding of the blush and emotional responses more generally.

References


Intentions and the Aesthetics of Artifacts

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Abstract

Although there is evidence that people’s response to an artistic or literary work can be affected by information about the work, there is still much to learn about the way people judge artifacts aesthetically when they know the intentions by which the artifacts have been designed. In this paper, we share the insights that we have gained into this topic by conducting research in the design field. By combining conceptual and experimental approaches to research, we have explored the appreciation of designers’ intentions, and have also examined the appreciation of designed products as means to fulfill these intentions. Our insights provide a basis to gain a deeper understanding of people’s aesthetic appreciation of artifacts.

Keywords: Aesthetics as a Function of Means and Effects; Design Aesthetics; Design and Intention; Design Literacy; Product Experience.

Introduction

People’s aesthetic appreciation of an artifact, such as a designed product, a work of art or a literary text, is often described as an appreciation of the artifact’s sensory properties; for instance, its shape, brushstroke or rhythm. Nevertheless, the aesthetic appreciation of an artifact can be far more complex, as it can involve a reflection on the artifact’s origin, on the reason why it was made the way it was made; thus, on the intention of its designer (product designer, artist or author). Although people do not have immediate access to the mental states that a designer went through when designing an artifact, and even the designer might not be able to recall these states retrospectively (Lloyd, Lawson, & Scott, 1995), they intuitively take a certain stance towards the artifact that makes them reflect on the designer’s intention (see Kelemen & Carey, 2007; see also Margolis, Laurence, & Barrett, 2008; Preisler & Bloom, 2008). Not only are people capable of inferring designers’ intentions directly from artifacts (Crilly, 2011a; 2011b), but they are frequently exposed to designers’ verbal statements, press releases, marketing campaigns, instruction manuals, and other sources of information from which they can explicitly learn about these intentions. Research in artifact aesthetics must therefore acknowledge that intention knowledge can affect aesthetic appreciation.

People’s response to an artistic or literary work is known to be affected by information about the work. This has not only been argued theoretically (e.g., Bullot & Reber, 2013; Gibbs, 2001), but has also been studied empirically. Yet, these empirical studies have not focused on the relationship between aesthetic appreciation and intention knowledge. On the one hand, they have shown that the (non-aesthetic) response to a work can be influenced by intention knowledge. For instance, the meaningfulness attributed to literary metaphors increases when the metaphors are credited to intentional poets, rather than to computer software acting randomly (Gibbs, Kushner, & Mills, 1991); also, the understanding of satirical texts increases with inferential knowledge about authorial intentions (Pfaff & Gibbs, 1997). On the other hand, studies have shown that the aesthetic response to a work can be affected by (non-intentional) information. For instance, the aesthetic response to pictorial and sculptural pieces is enhanced by influence of information about style and “artistic mood” (Cupchik, Shereck, & Spiegel, 1994); similarly, the aesthetic experience of abstract paintings is enhanced when the paintings are presented with metaphorical titles rather than with descriptive titles or no titles at all (Millis, 2001). The relationship between perceived intentions and aesthetics has been examined exceptionally, but only to be overshadowed by the more obvious relationship between perceived intentions and ethics (Hawley-Dolan & Winner, 2011). In contrast to previous research, we propose studying the relationship between aesthetic appreciation and intention knowledge.

With this paper, we share the insights that we have gained into this topic by conducting research in the field of design. We describe the development of a research project that addresses the questions: Does intention knowledge affect aesthetic appreciation? If so, how? And, what principles govern aesthetic appreciation in this sense? Searching for answers, we have developed a conceptual model and initiated experimental research based on it. We have explored the appreciation of designers’ intentions, and have also examined the appreciation of designed products as means to fulfill these intentions. Rather than definitive answers, our insights provide a basis for further the examination of the issues that might deepen our understanding of artifact aesthetics.
Developing a Conceptual Model and Initiating Experimental Research

In the early phase of our research, we developed a simple conceptual model to describe the artifact. According to philosophical theories (see Dipert, 1993; Hilpinen, 1992; Vermaas, Carrara, Borgo, & Garbacz, 2013), an artifact can be understood as a product that has been designed (by an intentional agent or designer) for a certain purpose or with a certain intention. In line with this, an artifact can be theoretically described as a product-intention relationship. In this simple conceptual model, the product represents the result of a design process, a “thing” (not necessarily physical) that is characterized by a particular sensory configuration (e.g., particular visual features), while the intention represents the aim or effect that the designer is trying to achieve through the product. Products and intentions can be categorized in a number of ways according to their features. For instance, designed products can be distinguished from artistic and literary products, and subcategorized into physical and virtual. Also, designers’ intentions can be distinguished from artists’ and authors’ intentions, and subcategorized into experiential, attitudinal or behavioral (this classification is based on Fokkinga, Hekkert, Desmet, & Özen’s, 2014). Thus, an artifact can be understood as a product-intention relationship, where both the product and the intention are characterized by specific features. This conceptual understanding of the artifact helps us explain how people perceive a designed product, such as the watch pictured in Figure 1.

People can perceive this watch as a product with certain visible features: the general features of a watch (e.g., face and hands), as well as some specific features, such as the hour hand reading “remember”, and the minute hand reading “you will die”. In addition, they can perceive this watch to be designed with a certain intention. This intention might not be as obvious as the product. It can be derived through inference, by thinking about what drove the designer to write such a statement on the hands of the watch (did he just want to be mean?); else, it can be perceived through an explicit source, such as the designer’s explanation that he actually designed this watch to stimulate a “seize-the-day” attitude among people (Jones, 2007). Regardless of its source and accuracy (notice that the inferred intention might not match the explicit intention), the perception of an intention allows people to perceive the product in relation to that intention; hence, to fully perceive the artifact. As we have described it, the full perception of the watch as an artifact involves the perception of a physical product and an attitudinal intention. People’s perception of an artifact thus involves the perception of a certain product and a certain intention.

An empirical study of artifact aesthetics requires some experimental representation of the product and the intention. In each case, there are a number of alternatives available. For instance, the product can be represented with a tangible thing or an image, while the intention can be represented with the product as such (assuming that the intention will be inferred from it) or with a text. For our first study, and similarly to studies that have used images and texts to represent artworks and artistic information (e.g., Bordens, 2010; Leder, Carbon, & Ripsas, 2006; Specht, 2010), we chose images to represent products (specifically, physical and virtual designed products) and texts to represent intentions (specifically, experiential, attitudinal and behavioral designers’ intentions).

With these stimulus materials, we conducted a pre-test/post-test control-group experiment to test the assumption that the aesthetic appreciation of products would be influenced by explicit intention knowledge (“Study 1” by Da Silva, Crilly, & Hekkert, 2013). The results of this study supported our assumption by indicating that aesthetic appreciation increases with such knowledge. Although these findings must be interpreted with attention to the materials used, i.e., certain representations of products and intentions that do not account for all possible products and intentions, they provided evidence that aesthetic appreciation can be affected by intention knowledge and triggered us to examine how this occurs.

Exploring the Appreciation of Intentions

We initially hypothesized that aesthetic appreciation had increased in our first study by a general aesthetic appreciation of the intentions used as stimuli. A theoretical basis for this hypothesis can be found in the field of psychology, where it has been argued that people do not only attain pleasure from perceiving the sensory properties of an artifact, but also from thinking about what they perceive to be the artifact’s “essence” (Bloom, 2011), which is the intention of its creator.

Figure 1: The Accurate by Crispin Jones (2007). Photo by (and courtesy of) the designer.
or designer (Bloom, 1996). Following this essentialist line of reasoning, we could assume that the participants of our first study attained aesthetic pleasure from the intentions as such and that this aesthetic pleasure influenced their overall aesthetic appreciation of the products. In order to test this assumption, we conducted a follow-up study with the same stimulus materials (“Study 2” by Da Silva et al., 2013). This study provided evidence that the perceived aesthetic quality of the intentions influenced the aesthetic appreciation of products: the more aesthetically pleasing an intention was perceived to be, the more its knowledge caused product appreciation to increase. Although these results supported our assumption, they did not provide a satisfactory answer to the question of how does explicit intention knowledge affect aesthetic appreciation. They did not suffice to claim that the change in the aesthetic appreciation of products could be fully attributed to the aesthetic appreciation of intentions; nor did they suffice to claim that the intentions were exclusively appreciated in an aesthetic sense.

To further explore how aesthetic appreciation can be affected by intention knowledge, we decided to conduct a series of one-to-one interviews with a subset of the stimuli used in the previously mentioned studies (Da Silva, Crilly, & Hekkert, in preparation). This interview study revealed that explicit intention knowledge affects the appreciation of a product in three ways: it changes the perception of the product, it enables an evaluation of the intention as such, and it enables an evaluation of the product as a means to fulfill the intention. In the study, the participants’ perception of the product changed in terms of their understanding of what the product did and what it meant; their evaluation of the intention was based on considerations of moral virtuousness; and their evaluation of the product as means was based on considerations of a number of determinants of aesthetic pleasure. These findings respectively indicated that intention knowledge affects product appreciation in cognitive, moral and aesthetic ways. They also suggested that, in order to examine the relationship between intention knowledge and aesthetic appreciation, our research project needed to focus on the appreciation of products as means to achieve certain (intended) effects. This was also suggested by the literature we reviewed, which pointed at the relationship between means and effects as a valuable criterion to examine the aesthetic appreciation of a variety of artifacts (see Boselie & Leeuwenberg, 1985).

**Focusing on the Appreciation of Products as Means**

Studying artifact aesthetics as a function of means and effects involves interpreting our conceptual model in these terms, i.e., interpreting the product as a means and the intention as an effect. We can take the watch presented in Figure 1 to be a means, and its designer’s intention of stimulating a seize-the-day attitude to be an effect. But thinking about aesthetics in terms of means and effects does not only involve changing the labels of our conceptual model. It involves acknowledging that this model can become more and more complex because, within and beyond a simple means-effect relationship, additional means-effect relationships can be perceived. Let’s go back to the example presented in Figure 1 to illustrate how additional means-effect relationships can be perceived within an apparently simple one. We have presented the watch as a means to stimulate a seize-the-day attitude. However, people will not necessarily perceive the watch to lead directly to such an effect. They might think, for instance, that the watch first leads to the realization that life is short, which in turns stimulates the attitude that they should seize the day. This reveals a chain of means and effects that goes across (A) the watch, (B) triggering the realization that life is short, and (C) stimulating a seize-the-day attitude, where A is a means to B (and, by extension, C); B is an effect of A and a means to C; and C is an effect of B (and, by extension, A). Exploring aesthetics as a function of means and effects involves acknowledging that a seemingly simple judgment of an artifact, such as “I like this watch”, might actually involve a complex train of thought.

Since we anticipated from our literature review that the means-effect relationship was a relevant criterion for the study of artifact aesthetics, we started exploring this theme at the end of the aforementioned interview study (this part of the study has been reported by Da Silva, Crilly, & Hekkert, 2014). This exploration, which involved asking participants what they thought of a certain product as a means to fulfill an intention (effect), revealed further complexities underlying the aesthetic judgment of artifacts. On the one hand, the participants assessed a given product in relation to alternative known or imagined means by which the same (or a similar) effect could be achieved. On the other hand, the participants assessed a given effect in relation to alternative known or imagined effects that could be achieved through a product with similar characteristics. Altogether, these findings indicate that the aesthetic appreciation of a given means-effect relationship involves perceiving, relating and comparing a number of alternative means and effects beyond that specific relationship. In other words, the aesthetic judgment of an artifact is grounded in a perceived set of alternative means and effects, which can grow more and more complex as a person interacts with artifacts and develops mental imagery of them.

Determinants of aesthetic pleasure, which seemingly describe the appreciation of products perceived independently of intentions, might actually account for the way in which they are appreciated when perceived within an array of means and effects. Novelty seems to be one of these determinants. The participants in our study indicated that a product is not judged to be novel by being perceived on its own, but by being perceived and compared with other existing and imagined means (judged to be more typical) by which the same effect can be achieved, as well as in comparison with the effect as such (also judged to be relatively typical). The participants also mentioned efficiency as a determinant of aesthetic pleasure, in line with literature mentioning “maximum-effect-for-minimum-means” as a key principle of design aesthetics (Hekkert, 2006; Hekkert &
Leder, 2008), as well as with literature describing the aesthetic appreciation of artifacts as diverse as science experiments (Crease, 2004), logical argumentations (Walsh, 1979), mathematical demonstrations (Hardy, 1967), and chess moves (Margulies, 1977). Both data gathered and existing literature thus suggest that the exploration of artifact aesthetics as a function of means and effects should attend to this principle.

Discussion
With this paper, we have shared the insights that we have gained into the way people judge artifacts aesthetically when they know the intentions by which the artifacts have been designed. We have done this by describing the development of a project in design research that has brought us closer to answering the questions: Does intention knowledge affect aesthetic appreciation? If so, how? And, what principles govern aesthetic appreciation in this sense? Guided by our conceptual insights, we have conducted empirical studies using both quantitative and qualitative methods. Our findings indicate that intention knowledge does affect aesthetic appreciation, as it enables the evaluation of an artifact in terms of a means-effect relationship. This evaluation involves taking into account a number of alternative means and effects that are perceived within or beyond that particular relationship. Furthermore, in line with a broad body of literature, our findings suggest that one of the principles governing aesthetic appreciation in this sense is the principle of maximum-effect-for-minimum-means. In short, we have initiated an examination of artifact aesthetics as a function of means (specifically, designed products) and effects (the effects that designers intend these products to have).

This examination can be continued by conducting a conceptual analysis of what maximum-effect-for-minimum-means implies about the aesthetic assessment of an artifact. As researchers in the design field, we are interested in theoretically explaining how the means-effect relationship can be established between a designed product (means) and a designer’s intention (effect) and, more importantly, how the magnitudes of a given product and a given intention can be assessed to be minimum and maximum. This involves reflecting on the possible relationships and comparisons that people establish with alternative means and effects in order to make such an assessment, as well as on the reason why they establish such relationships and comparisons in the first place. This theoretical work could serve as a basis for future empirical studies, which could test the sense in which the maximum-effect-for-minimum-means principle accounts for people’s aesthetic appreciation of certain artifacts.

Empirical studies following this line of research will face at least three experimental challenges. A first challenge involves choosing certain means and effects as stimulus materials, as well as certain experimental representations of them. We used physical and virtual designed products, and experiential, attitudinal and behavioral designers’ intentions. Focusing on a certain product category, e.g., watches or wearable accessories, and a certain kind of intentions, e.g., practical (“giving the time of day”) or cruel (“being mean to people”), would have the benefit of providing category-specific knowledge, but would also make the results of a study less generalizable. As for the experimental representations, we chose to use images and texts. This decision entailed certain disadvantages. Representing products with only static images denied us the opportunity to study aesthetic appreciation in the context of real human-product interactions. Also, drafting intentions based on actual designers’ statements was a difficult task, as it required us to “dissect” the designers’ trains of thought (i.e., means-effect chains) in a controlled manner. A second challenge involves defining variables and controlling for possible confounds. Our first study focused on the influence of explicit knowledge of designers’ intentions on the aesthetic appreciation of designed products, and anticipated no confounds. A more accurate study of artifact aesthetics should acknowledge that intention knowledge can also be acquired through inference, and that it can affect the appreciation of an artifact in non-aesthetic ways, i.e., cognitively and morally. A third challenge concerns the selection of participants, particularly in terms of their design (or artifact) literacy. Because thinking and verbally reflecting about designed products in intentional terms is not necessarily an easy task for people with low levels of design literacy, we selected design students as participants to ensure a minimum level of such literacy. Although lay participants would make the results of a study more generalizable, participants with a certain level of design literacy can provide a more articulate explanation of a complex phenomenon that would otherwise remain unspoken. These are all things to be considered when designing future studies. Clearly, examining artifact aesthetics as a function of means and effects is not devoid of challenges, but it is rich in possible rewards. Such an examination will bring us closer to unraveling how people attain aesthetic pleasure from artifacts, even when the artifacts are not judged to be attractive in terms of the features that they exhibit.

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How Our Desire for Social Information Affects Tastes in Paintings and Belief Systems

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Abstract
Psychology has found a many explanations for what makes art compelling. People can also find that belief systems, such as religions or health ideas, resonate with them. We know that how much people feel positive about ideas influences their actual endorsement of those ideas. We show that the depiction of human beings positively affects both art and belief. Experiment 1 shows that in paintings around the world, depictions of people dominate. Experiment 2 shows that for alien abduction theory, the look of the bald “grey” alien has features that we use to indicate intelligence in human beings: being tall, and having a small nose. This supports the theory that we find art and belief systems compelling for the same reasons.

Keywords: art; alien abduction; belief systems; aesthetics; psychology; perceptions of intelligence; social reasoning.

Introduction
The appeal of visual images of human beings seems intuitive, but why would this be? According to the social compellingness theory (Davies, 2014), it is because our minds have evolved to be particularly interested in human affairs.

Human beings have lived in hierarchical social environments for a long time. Exactly how long is debated, but most agree that we have lived in cooperative groups since, at least, the dawn of agriculture 10,000 years ago, and probably longer (Haidt, 2012). Human beings have been, and continue to be, a social species. One’s survival and reproduction, then and now, depends on maintaining a network of social relationships and social knowledge about the social milieu one lives in. Other people are necessary for our prosperity, but are also our greatest rivals and enemies. The resulting hyperactive sensitivity to anything to do with people known variously as “the hypertrophy of social cognition” (Boyer, 2003), “agenticity” (Shermer, 2011), “anthropomorphism” (Guthrie, 1993), “overactive theory of mind” (Bering, 2011), and the “hypersensitive agency detection device” (Haidt, 2012).

We see people where there aren’t any, as when we see faces in mountainsides, but rarely do we see mountainsides in faces. The evolutionary explanation offered for this effect is that the cost of mistaking seeing a person is greater than the cost of mistaking something inanimate for a person. Indeed, there is a region of the neocortex, called the fusiform face area that might be specifically evolved for facial recognition (Kanwisher, McDermott, & Chun, 1997).

We are also very quick to ascribe intentionality to events, rightly or wrongly. For example, cultures worldwide tend to attribute sickness to curses cast by other people (Boyer, 2001, p. 169).

Whatever it is called, what is clear is that we have a great interest in the affairs of people. We actively seek information about them, and are more interested in something if it has to do with people. As such, it is no surprise that depictions of human beings dominate the visual arts.

It is also striking that religions worldwide involve beliefs in supernatural agents that resemble people in their basic psychology. Gods, spirits, and ghosts have desires, beliefs, and goals. According to the social compellingness theory, our desire to understand and attend to matters of human or humanlike social interaction means that a particular stimulus will be more compelling if it features people and social interactions, whether that stimulus is a work of art, such as a painting, or a belief system, such as astrology.

In this paper, we present two experiments intended to show how depictions of person-like entities make both art and belief systems more compelling. Experiment 1 is a survey of world art, in which the number of people in each work of art was counted. Experiment 2 takes a popular paranormal belief, that people have been abducted by intelligent aliens, and shows how our interpretation of alien anatomy mirrors our beliefs about human beings in terms of perceived intelligence.

Experiment 1
Social compellingness theory predicts that depictions of human beings, as opposed to, say, other animals or objects, should dominate popular art. This is not a surprising prediction, but no survey has been done to determine the extent to which this is true. In the current study a survey of artistic images was conducted to count the number of people in every image in a typical art history textbook. Social compellingness theory predicts that there will be a great deal of images of people, so as a comparison, the number of non-human animals (hereafter “animals”) were also counted.
Method
A then-undergraduate named Rebecca Frerotte conducted the survey. She was a third-year undergraduate in art history. She was not informed of the hypothesis of the study until after the data were collected.

Frerotte chose a representative art history textbook, *Art Past Art Present* by David G. Wilkins, Bernard Schultz, and Katheryn M. Linduff (2008). This book was chosen for its selection of art in terms of its breadth in history and geography. The book contained works of art in various media, including paintings, drawings, and sculpture.

For each artistic image in the book, where applicable, Frerotte recorded the following information: 1) the Figure number, 2) the number of people depicted, 3) the number of non-human animals depicted, 4) the period of movement to which the art belongs, 4) the medium, and 5) the geographical origin of the image. This survey took her approximately 15 hours to complete.

Images in the book that were deemed to be not visual art, such as maps, schematic sketches, or architecture were not counted. In total there were 432 artistic images, many of them paintings, referred to hereafter simply as “images.”

One difficulty was the occasional inability to clearly view the artwork or art object portrayed in the reproduction. Also in many cases only details (subsections) of artworks were shown. In paintings where there were depictions of statues as well as humans, only those figures depicted which appear to be intended as persons (or very human-like beings such as angels) were counted as human. So, for example, if an interior scene featured a wall on which was painted children, those children were not counted as human for the purposes of this study.

The first hypothesis was that there would be more images with humans in them than images without. The second hypothesis was that there would be more images depicting humans than other animals.

Results and Discussion
Of the 432 images in the book, only 95 had no people depicted (22.9%), as opposed to the 337 that featured at least one person (78%). There are over three times as many images with people in them than without. The second hypothesis was that there would be more images depicting humans than other animals.

The results were not affected by historical period. We compared the 1500s, Baroque, and Renaissance periods because they were the movements which were associated with the largest numbers of paintings (respectively 31, 29, and 21).

The data also reveal that low numbers of people (and animals) are more common than high numbers. This tendency might be explained by the fact that small numbers of people are more conducive to interaction, particularly conversation. The maximum group size for conversation has been estimated to be about five (Dunbar, 1993). It could be that small numbers of people feel more comfortable for us, resulting in our preference for art depicting small groups.

Our study is limited in that the book tends to depict famous works of art, rather than a representative sample of *all* art created. We hope future research will explore these hypotheses with more representative data sets. That said, given that we are interested in compelling art, the most famous works might be the best to measure.
Experiment 2

Many people believe that aliens have visited our planet and interacted with human beings. One of the most popularly believed-in alien types is the “grey,” a relatively short, hairless humanoid with big, slanted eyes and a small nose (see Figure 2 for a depiction). Though science has discredited this “extraterrestrial hypothesis” (EH) and the existence of the greys, the fact that people continue to believe in them is an interesting puzzle.

Novella (2000) argues that it could be the physical appearance of extraterrestrials as portrayed in the media that affects the intelligence we attribute to them. Is it possible that the grey alien portrayed in the media is an exaggeration of the physical features that we attribute to perceived human intelligence or do people believe them intelligent merely because we associate them as being interstellar travelers?

Experiment 2 explores the idea that the greys’ physical appearance has evolved (through cultural evolution) to look smarter by accumulating exaggerated features that humans judge as intelligent. If this is true, then if the greys were portrayed with different physical characteristics, people would perceive them to be less intelligent.

What features contribute to perceptions of intelligence?

If the appearance of an extraterrestrial is a peak shift of features, an effect seen when a human or animal has a heightened response to an exaggerated stimulus, that make humans appear intelligent (Ramachandran & Hirstein, 1999), then understanding which features contribute to the extraterrestrials’ perceived intelligence will suggest which features affect our judgments of other humans. Specifically we will focus on how three features (nose size, eye size, and height) affect an individual’s perception of intelligence.

Hsiao and Cottrell (2008) looked at facial recognition and found that the nose, or slightly to the left of the nose, is the first physical feature we attend to. Because of this and the fact that we judge the intelligence of a person in the first 39 milliseconds of seeing them (Bar, Neta, & Linz, 2006), it is reasonable to conjecture that the nose might play into our perception of a person’s assumed intelligence. In Experiment 2 we test what size of nose makes the extraterrestrial appear more intelligent. We hypothesize that a big nose intuitively makes an alien appear less intelligent.

Because people with larger eyes are perceived as more intelligent than those with smaller eyes (Paunonen, Sampo, Ewan, Earthy, Lefave, & Goldberg, 1999) we hypothesize that an alien depicted with larger eyes will be judged as more intelligent than one depicted with smaller eyes.

Height is a characteristic of genetic fitness in humans, and a fitter mate is viewed as more intelligent (Miller, 2000). In one study, taller women are seen as more intelligent than shorter women by both male and female participants (Chu & Geary, 2005). We assume from this study that taller men are also seen as more intelligent than shorter men, although this has not yet been tested directly. Studies also show that there is a correlation between height and actual intelligence; one suggested explanation for this is that better nutrition plays a role in both higher intelligence and increased height (Case & Paxson, 2006). Thus we hypothesize that a tall extraterrestrial will be perceived as more intelligent than a shorter extraterrestrial.

Overall, we hypothesize that one or more of the physical characteristics of how greys are reported to appear, such as eye size, nose size, and height, contributes to our perceiving them as intelligent. To test this, participants looked at images of extraterrestrials and rated their intelligence. All of the images were similar to each other, with at least one variable manipulated per stimulus presented. We predicted a main effect of tall, large eyes, small nose, and that features such as short, small eyes, and large nose would be negatively associated with perceptions of intelligence. As well, the general “intelligent features” extraterrestrial will be seen as the most intelligent, and the “unintelligent features” extraterrestrial will be seen as the least intelligent.

Method

36 participants were recruited for this experiment. Participants were either Carleton University students or were recruited through personal contact. Participants had normal or corrected to normal vision. 15 participants were male and 18 were female, and the gender of 3 was unaccounted for.

Computer generated images of extraterrestrials were generated using a piece of software called Creature Creator Pro. Images were presented on paper along with a 7 point scale. Each question used a 7 point scale in order to rate the perceived intelligence of the stimuli, 1 being “extremely below” and 7 “extremely above”. See Figure 2 for an example of a question participants would have seen.

Figure 2: This figure displays an example of one of the pages shown to participants.
There were 9 different stimuli created for the experiment. Refer to Table 1 for the feature combinations of a specific stimulus.

Table 1. This table shows the given feature combinations for a specific stimulus. Each row represents a different stimulus and its determined feature combinations.

<table>
<thead>
<tr>
<th>Stimulus Name</th>
<th>Average</th>
<th>Height</th>
<th>Nose</th>
<th>Eyes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intelligent Features</td>
<td>Tall</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Unintelligent Features</td>
<td>Short</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Tall</td>
<td>Tall</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Short</td>
<td>Short</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Large Nose</td>
<td>A</td>
<td>Large</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Small Nose</td>
<td>A</td>
<td>Small</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Large Eyes</td>
<td>A</td>
<td>A</td>
<td>Large</td>
<td></td>
</tr>
<tr>
<td>Small Eyes</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>Small</td>
</tr>
</tbody>
</table>

A = average

The stimuli were printed on sheets of paper, with one stimulus, question and scale per page. This was done to discourage direct comparison of one stimulus to the others. The order of the images was randomized for each package.

Participants were instructed verbally and in writing to look at each image and determine the perceived intelligence of the stimulus. Six different forms of a question appeared for each stimulus type. Variations of the word “smart,” such as smart, intelligent, bright, and logical were used (refer to Table 2 for all question variations).

### Results and Discussion

Tests of reliability were run on all stimulus types (for example, the Tall stimulus, or the Large Nosed stimulus) for all of the questions asked. In all cases Cronbach’s alpha was at least 75% (κ = 0.75) or higher. See Table 2. For all ANOVAs run in this experiment, there was no main effect of question (p>0.05), as well there was no main effect for the interaction between the stimuli being tested and the questions asked (p>0.05).

Overall it was found that participants judge the intelligence of different stimuli differently (F(3.2) = 3.84, p < 0.05). The physical features of the stimuli affected their perceived intelligence. A 9 (Stimuli) x 6 (Question) Repeated measures ANOVA was run. Mauchly’s test of sphericity reached significance. Consequently, results for this ANOVA are reported using the Greenhouse-Geisser corrected test. Figure 2 shows the judged intelligence ratings given to the stimuli averaged across participants and the questions asked.

Four 2 (Stimuli) x 6 (Question) repeated measures ANOVAs were run to compare each stimulus feature. Table 2 shows that the Tall stimulus was rated as significantly more intelligent than the Short stimulus (F(1) = 6.97, p < 0.05, η² = 0.17). Smaller nose size also increased the judged intelligence of the stimuli (F(1) = 6.20, p < 0.05, η² = 0.15). Difference in eye size did not affect the judged intelligence of the stimuli found (F(1) = 1.15, p > 0.05, η² = 0.034). It is possible our experiment did not have enough power to detect an effect.

Table 2: Results. This table reports the mean and standard deviation for each of the 9 stimuli, averaged across all participants and all 6 questions. It also reports the reliability measure, reported as Cronbach’s alpha, for the questions asked for a given stimulus, averaged across all participants. *SD refers to Standard Deviation.

<table>
<thead>
<tr>
<th>Stimuli Name</th>
<th>Mean</th>
<th>SD*</th>
<th>Cronbach’s alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>4.89</td>
<td>0.13</td>
<td>0.80</td>
</tr>
<tr>
<td>Intelligent Features</td>
<td>4.74</td>
<td>0.17</td>
<td>0.89</td>
</tr>
<tr>
<td>Unintelligent Features</td>
<td>4.19</td>
<td>0.24</td>
<td>0.92</td>
</tr>
<tr>
<td>Tall</td>
<td>4.85</td>
<td>0.13</td>
<td>0.75</td>
</tr>
<tr>
<td>Short</td>
<td>4.32</td>
<td>0.21</td>
<td>0.89</td>
</tr>
<tr>
<td>Large Nose</td>
<td>4.42</td>
<td>0.19</td>
<td>0.89</td>
</tr>
<tr>
<td>Small Nose</td>
<td>4.71</td>
<td>0.15</td>
<td>0.83</td>
</tr>
<tr>
<td>Large Eyes</td>
<td>4.62</td>
<td>0.18</td>
<td>0.91</td>
</tr>
<tr>
<td>Small Eyes</td>
<td>4.79</td>
<td>0.15</td>
<td>0.79</td>
</tr>
</tbody>
</table>

The Intelligent Features stimulus was judged to be more intelligent looking than the Unintelligent Features stimulus (F(1) = 4.80, p < 0.05, η² = 0.12).

Overall there was a correlation between the physical features of the extraterrestrial images and their perceived intelligence. We found that being tall and having a small nose contributed to increased perceptions of intelligence. Though the differences for eye size were in the hypothesized direction, there was no significance.

We found that certain physical features predict increased intelligence judgments in stimuli depicting alien beings. In general, the features that had an effect are consistent with previous work on perceptions of intelligence, as well as the idea that we base some ideas of intelligence on neoteny, or looking child-like.

Specifically, we found that higher intelligence was perceived in aliens depicted as being tall and having a small nose. Our hypothesized overall “intelligent alien” (tall, big eyes, small nose) was also perceived to be more intelligent than our hypothesized “unintelligent alien” (short, big nose, small eyes.)

These features, we suggest, are a peak shift (Ramachandran & Hirstein, 2010), or are supernormal stimuli (Barrett, 2010) for intelligence in humans. That is, we suggest that the look of the grey works as a cultural myth because the physical features of the greys are exaggerations of what function as cues for intelligence in human beings. Suggested aliens that do not conform to these tendencies we have would not gain the widespread acceptance that the greys do.

Our finding is consistent with the theory that neoteny predicts intelligence and intelligence judgments. When a species is called neotenous when there are fewer physical
differences between juveniles and adults. Across primates, the more intelligent a species is, the less an individual changes during development. Humans are more neotenous than gorillas because we look more like babies than adult gorillas look like infant gorillas. Neoteny probably happens because the species develops more slowly than other species and retains many of its juvenile characteristics (Choi, 2009). Davies (2014) proposes that neoteny is also tied to perceptions of intelligence. One explanation for the relationship between intelligence and a youthful appearance is that a major part of being intelligent is having the ability to learn. In general, the young are better learners than adults. Fluid intelligence peaks in young adulthood and declines from then on (Lee, et al., 2005). Younger brains are more flexible, more plastic. Neoteny might be the result of evolutionary pressure that resulted in slowed development—that is, we stay young longer by aging more slowly. Indeed, this is probably what happened over thousands of years to turn wild dogs into domestic dogs (Morey, 1992).

Our failure to find that larger eyes predicts intelligence judges goes against the results found by Paunonen et al. (1999). It was originally thought that large eyes would be consistent with higher ratings of intelligence based on the findings by Paunonen et al. (1999). The findings are consistent with Zebrowitz & Montepare (1992) however. The Large Eyed stimulus used in this study had large eyes, a large cranium, and a small chin. It could be that participants thought the Large Eyed stimulus, when coupled with these other features, looked intellectually naïve. Zebrowitz & Montepare (1992) found similar results when they had individuals rate baby-faced adults on various measures, such as degree of naïveté.

It was not found to be case that the overall intelligent looking stimulus, the extraterrestrial that was tall, had large eyes and a small nose, was judged as the significantly most intelligent stimuli, the converse is also true. The extraterrestrial that had all of the determined unintelligent features, short, had small eyes and a large nose, was not judged as the significantly least intelligent of all the stimuli. Perhaps with more participants the data could reach significance.

In one way the typical grey alien does not conform to the results we found here. Although we found that tallness predicted perceptions of intelligence, and this has also been found for stimuli of humans as well (Chu & Geary, 2005), the typical grey in the alien abduction narrative is not particularly tall—about the height of the average human woman (Malmstrom & Coffman, 1979).

Another feature of greys that we did not explore in this study is their baldness. Preliminary evidence suggests that bald men are perceived to be more intelligent than men with hair (Judg.me Blog, 2012).

Future experiments should look at fewer features, but in more depth. This experiment does not contain all of the possible combinations of features and thus does not show reactions to all possible effects or interactions. Looking at fewer features with all possible combinations could refine these results further.

Conclusion

As animals that evolved in societies, we have a penchant for depictions and descriptions of people and social interactions and relationships. According to the social compellingness theory, all else being equal, stimuli that feature social information will be more compelling. In this paper we have described how this tendency manifests itself in art and in belief systems. Experiment 1 showed that most visual art features human beings.

In one popular belief system, alien abduction, humanoid creatures are said to be abducting people. Although we might focus on how aliens differ from human beings, the similarities are striking, from biology to motivation. Experiment 2 showed that we attribute intelligence to these supposedly space-faring beings using some of the same cues we use for predicting intelligence in our fellow human beings. This supports the idea that aliens are viewed, at least
in part, as people. We argue that this contributes to the compellingness of the Extraterrestrial Hypothesis. The idea that a short, fat, hairy alien with a big nose would be intelligent enough to build spaceships would strike the public as implausible due to their prejudices and the cues they use to determine intelligence. Aliens that look intelligent are more compelling because they fit the narrative better.

This work supports the “compellingness foundations theory,” as explicated in Davies (2014), which holds that we find works of art and belief systems compelling for the same reasons. Future empirical work will further test this idea.

References
Judg.me Blog (2012 (retrieved May 22, 2012)). What makes one appear smarter and more sociable? http://judg.me/blog/judgment-day/
Flow Experience and Self-Regulation in Music Performers
After a Procedure of Emotion Induction

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Abstract
Two hundred musicians were administered after a public exhibition a mood induction procedure, the Flow State Scale and a Self-regulation Scale, collecting also information on the use of mental strategies to withstand negative emotions. Results have shown that flow experience varied depending on the type of instrument used and self-regulatory characteristics of the subjects involved. Self-regulation and flow are strongly correlated among pianists and vocal performers. The emotional induction affects the self-evaluative judgments on own performance. Past experience in practice of music, while results in better performance levels, does not constitute an advantage in emotional management. The use of mental strategies is associated with the formulation of more realistic judgments, with a better protection and management of interfering emotions.

Keywords: flow; self-regulation; musical performance; emotion induction; self-assessment.

Introduction
Flow, or optimal experience, can be broadly defined as a psychological state involving the positive experience of being fully engaged in the successful pursuit of an activity (Csikszentmihalyi, 1990), and due to its intrinsically rewarding nature, flow seems to motivate humans to keep returning to the flow-inducing action and meeting greater challenges. Csikszentmihalyi (1990) developed a nine-dimensional flow construct. Based on these dimensions, flow is characterized by challenge-skil balance (feeling competent enough to meet the high demands of the situation), action-awareness merging (doing things spontaneously and automatically without having to think), clear goals (having a strong sense of what one wants to do), unambiguous feedback (knowing how well one is doing during the performance itself), concentration on the task at hand (being completely focused on the task at hand), sense of control (having a feeling of total control over what one is doing), loss of self-consciousness (not worrying what others think of oneself), transformation of time (having the sense that time passes in a way that is different from normal), and autotelic experience (feeling the experience to be extremely rewarding).

A relationship between flow and superior performances and achievement was previously found by others (O’Neill, 1999; MacDonald et al., 2006; Baker and MacDonald, 2013). Research on musicians’ personalities has largely focused on differences between musicians of various instrument groups and musical styles (Buttsworth and Smith, 1995; Kemp, 1996; Cribb and Gregory, 1999; Langendörfer, 2008; Hernandez et al., 2009; Vuust et al., 2010), the relationship between personality and performance anxiety (Cooper and Wills, 1989; Marchant-Haycox and Wilson, 1992).

Considering more specifically the experience of flow, in the Sinnammon et al. (2012) study, the ranking of the nine subscales for the elite sample (studying music performance on a full-time basis) showed that clear goals, autotelic experience, clear feedback and challenge-skil balance were the four dimensions with the highest mean ratings. Csikszentmihalyi (1990) has already proposed that certain personality traits, such as curiosity, persistence and low self-centeredness, may be characteristics of people who can easily achieve flow states. According to Marin and Bhattacharya (2013), trait emotional intelligence and amount of practice predict flow in pianists.

At present, there appear to be limited studies that relate the flow with the self-regulation of musical performers (Miksza, 2011, 2013). At a basic level, self-regulation is the ability to adapt mental, emotional and physiological state to the task at hand, including through the use of active or implicit strategies.

Our idea is that the use of strategies of self-regulation promotes the flow and especially allows to better manage the interference of negative emotions, which can occur even by stimuli strictly not related to the context of the reference that is the public performance (as associations of thoughts, random stimuli antecedents, etc.). The interference of negative emotions is not necessarily related to performance anxiety, it may affect not only the level of performance, but also distort the judgment on the level of involvement, the global and technical assessment of interpretation performed, the grade of satisfaction perceived, the comparison with the expectations of the performer himself.
**Aims**

Assessing whether different instruments used by a sample of musicians are significantly associated with different perceived levels of flow; measuring the correlations between the dimensions of flow and self-regulation among the performers; determining whether positive or negative emotional activation influences the judgment on their musical performance.

**Instruments and Methods**

A sample of 200 subjects has been selected, aged between 15 and 28 years old, enrolled in the last classes of the Conservatory of Music in Frosinone (Italy), with assiduous practice of musical exhibition for at least seven years. The sample was structured into performers of piano, performers of wind instruments, performers of string instruments, and vocal performers. Information was collected on the use of mental strategies to withstand negative emotions, the pressure of the public and to improve concentration. After running each participant a selected piece of music lasting twenty minutes, we proceeded to the mood induction on the subjects through the presentation of specific emotional texts according to the technique of the guided imagery (Mayer, Allen, Beauregard, 1995), afterwards it was administered the Flow State Scale (Jackson & Marsch, 1996, Italian adaptation by Muzio, Nitro and Rind, 1998) and the Self-regulation scale from Multidimensional Personality Profile (Caprara et al., 2006). Finally we collected assessments on the quality of technical and interpretative execution, the perceived satisfaction from the same performers and from a music teacher who was present at the execution and agreed to participate in the study by filling out an evaluation form of the individual musicians after their execution.

**Statistical Analysis and Results**

200 subjects participated in the study (86 males and 114 females, mean age 21, SD: 6.5). With respect to distribution of the instruments: 112 piano, 38 string instruments, wind instruments 22, voice 28. 104 randomly selected subjects received a positive emotional induction training; while others 96 were subjected to a negative emotional induction training. From the analysis of the scores on the scale of the flow is shown that splitting the subjects by instrument, were obtained significant differences to the sub-dimensions of the flow and to the value of the total flow.

Specifically, comparing the group of pianists with the performers of stringed instruments, it was found that for dimension D7 (loss of self-consciousness), there was a significant difference (.05) between the means: 3.20 (piano) and 2.7 (string). For the dimension D9 (autotelic experience) there was a significant difference (.003) between the means: 3.76 (piano) and 3.00 (string). Compared to the total flow, there was also a significant difference (.05) between the means: 3.45 (pianists) and 3.1 (string).

Comparing the group of pianists with those of wind instruments there were no significant differences to be noted. While among pianists and vocal performers were recorded several significant differences: among dimension D2 (union between action and consciousness) mean difference is significant (Sig. .001) with 3.08 (piano) and 4.14 (vocal); on dimension D3 (clear objectives) there was a significant difference (.05) between the mean 3.8 (piano) and 4.3 (vocal); for dimension D5 (concentration on the task), there was a significant difference (.04) for mean 3.7 (pianists) and 4.3 (vocal); to the dimension D6 (sense of control), there was a significant difference (.04) between the mean 3.3 (piano) and 3.9 (vocal); for the dimension D8 (distortion of the sense of time) there was a significant difference (.02) between the mean 3.0 (piano) and 3.7 (vocal). For the total flow, there was a significant difference (.01) between the mean 3.4 (piano) and 3.9 (vocal).

Comparing the group of musicians with stringed instrument with those using a wind instrument did not reveal any significant differences. Comparing the group with stringed instruments and vocal performers, revealed several significant differences: for the dimension D1 (balance between challenge and skill), there was a significant difference (.03) between the mean 3.3 (string) and 4.0 (voice); for the dimension D2 (union between action and consciousness), there was a significant difference (.001) between the mean 2.8 (string) and 4.1 (vocal); for the dimension D5 (concentration on the task), there was a significant difference (.02) between the mean 3.5 (string) and 4.3 (vocal); to the dimension of D6 (sense of control), there...
was a significant difference (.02) between the mean 3.0 (string) and 3.9 (vocal); for the dimension D7 (loss of self-consciousness), there was a significant difference (.02) between the mean 2.7 (string) and 3.6 (vocal); for the dimension D8 (distortion of the sense of time), there was a significant difference (.02) between the mean 2.7 (string) and 3.7 (vocal); for the dimension D9 (autotelic experience), there was a significant difference (.05) between the mean 3.0 (string) and 3.7 (vocal). For the total flow, there was a significant difference (.002) between the mean 3.1 (string) and 3.9 (vocal).

Comparing the group with wind instruments and vocal performers, revealed several significant differences: for the dimension D2 (union between action and consciousness), there was a significant difference (.004) between the mean 2.6 (wind) and 4.1 (vocal); for the dimension D5 (concentration on the task), there was a significant difference (.04) between the mean 3.3 (wind) and 4.3 (vocal); to the dimension of D6 (sense of control), there was a significant difference (.04) between the mean 2.8 (wind) and 3.9 (vocal); for the total flow, there was a significant difference (.04) between the mean 3.0 (wind) and 3.9 (vocal).

We then proceeded to explore the correlations between the sub-dimensions of the scale of the flow and the scale of self-regulation. It emerged a correlation of .30** for p < .005 with D9 (autotelic experience), of .28** with D6 (sense of control); for p < .05 resulted a correlation of .22* with D4 (direct and immediate feedback), of .20* with D5 (concentration on the task). Among total flow and self-regulation there was a correlation of .21* always for p < .05.

By analyzing the correlations depending on the instrument used, it was found that pianists showed a higher correlation with the dimension D5 (concentration on the task) and specifically a value of .47 ** for p < .005; then with D6 (sense of control) r = .39 **; for p < .05, r = .32* correlated with D9 (autotelic experience), r = .31* with D3 (clear objectives), and .26* with D4 (direct and immediate feedback). The total level of flow was correlated with the self-regulation with a value of .43**. For musicians of string and wind instrument there were no significant correlations. Vocal performers revealed a correlation value of .63* for p < .05 with D4 (direct and immediate feedback), r = .49* with D9 (autotelic experience).

We then proceeded investigating whether post-execution emotional induction could have a significant influence on the self-evaluation of the musicians. The data showed that the subjects underwent to a positive stimulus got an average 3.77 compared to 3.28 of the subjects who underwent negative emotional induction with reference to the global judgment on the execution performed (Sig. .01). On the level of perceived satisfaction, there was an average of 3.38 per positive induction and 2.73 for negative one (Sig. .01). Confronting the expectations on the quality of the execution it emerged a significant difference (Sig. .05) among those who received a positive induction, which reported an average 3.77 compared to 3.28 of the subjects who underwent negative induction, which reported an average of 1.6.

We also wanted to assess whether years of musical experience or age of the subjects could be a mediating factor on the interference of the emotional stimulus. But there were no significant differences comparing groups according to age and years of musical experience. We then proceeded to the comparison between the global self-assessment of musician and the judgment expressed by the teacher.

The data showed that the group receiving negative emotional induction reported scores not in line with the
judgment of the teachers and tended toward lower levels, taking a direction opposite to the rating on the interpretation of musicians given by the teacher. While the self-report of the group subjected to positive emotional induction were found to be positively correlated with the judgment of the teachers. More specifically, the global self-evaluation was related to the global judgment of the teacher with \( r = .43^{**} \), to the technical judgment of the teacher with \( r = .49^{**} \), to the judgment on the interpretation with \( r = .41^{**} \), and to the degree of satisfaction with \( r = .39^{**} \). The technical self-evaluation was correlated to the global evaluation of the teacher with \( r = .37^{**} \), to the technical judgment of the teacher with \( r = .52^{**} \), to the judgment of the interpretation with \( r = .37^{**} \), and to the degree of satisfaction with \( r = .36^{**} \). The self-evaluation of the interpretation was correlated to the global evaluation of the teacher with \( r = .55^{**} \), to the technical judgment of the teacher with \( r = .51^{**} \), to the judgment of the interpretation with \( r = .53^{**} \), and to the degree of satisfaction with \( r = .46^{**} \). The self-assessment of the degree of perceived satisfaction was correlated to the global evaluation of the teacher with \( r = .39^{**} \), to the technical judgment of the teacher with \( r = .41^{**} \), to judgment of interpretation with .39 **, and to the degree of satisfaction with \( r = .39^{**} \). We then analyzed the differences, depending on the mental strategies, in the experience of flow among the group receiving negative emotional induction.

The data showed differences between those who use mental strategies compared to those who do not use them. Specifically the dimensions of flow concerned were: D1 (balance between challenges and skills) for the group that makes use of strategies which reported an average of 3.12 while the group that makes no use presented an average of 3.37 (Sig. .02 to t-test); D4 (direct and immediate feedback) for the group that makes use of strategies which reported an average of 3.6 while the group that makes no use presented an average of 3.0 (Sig. .02 to t-test); D6 (sense of control) for the group that makes use of strategies which reported an average of 3.8 while the group that makes no use presented an average of 3.0 (Sig. .01 to t-test); D9 (autotelic experience) for the group that makes use of strategies which reported an average of 4.2 while the group that makes no use has presented an average of 3.2 (Sig. .007 to t-test); considering total level of flow, the group that makes use of strategies reported an average of 3.7 while the group that makes no use presented an average of 3.2 (Sig. .03 to t-test). Among the group subjected to positive emotional stimulus, the only significant difference was found in the size D8 (distortion of the sense of time) where the group that uses mental strategies reported an average of 3.5 while the group that does not use mental strategies reported an average of 2.8 (Sig. .04).

Finally, we passed to analyze the differences, depending on the mental strategies, in the self-evaluation of the performance in the group which received negative emotional induction.

The data showed significant differences with the highest average among those who use mental strategies, which reported to self-report on global performance an average of 3.89 compared to 3.43 of the subjects who did not use mental strategies (Sig. .05). Considering the self-evaluation on technical execution, subjects who use mental strategies reported an average of 4.10 compared with 3.37 for subjects not using mental strategies (Sig. .01). The self-evaluation of the interpretation revealed no significant differences (3.90 and 3.80). Considering self-report assessment of perceived satisfaction, those who use mental strategies reported an average of 3.90 compared to 2.80 for subjects not using mental strategies (Sig. .03). In the group receiving positive emotional induction according to mental strategies, reported significant differences in the self-evaluation of global execution, with averages of 3.30 and 3.86 (Sig. .01); in the self-evaluation of technical execution, averaging from 3.17 to 3.71 (Sig. .01).
Considering the judgments expressed by the teachers, these did not show significant differences between those using and those not using mental strategies in both conditions (positive or negative induction). Analyzing the perceived pressure of public, it was found that among those who do not use mental strategies there were more people who feel the pressure from the public. The 67.2% of those not using mental strategies sensed the pressure of the public, compared to 48.5% of those using mental strategies. While not feeling the pressure of the public were 32.8% of those not using the strategies and 51.5% of those who use the strategies.

Discussion

It can firstly be noted that the experience of involvement in the activity and performing identification has been perceived in a different way depending on the instrument used. The levels of total flow were increased in pianists (3.44) and to a decreasing extent have featured musicians of wind instruments (3.16) and musicians of stringed instruments (3.13). However, in comparison with the group of vocal performers there was a clear difference for the latter that showed higher level of total flow (3.90). Probably this difference is due to instrumental mediation for the execution of the performance and to interference of the greater reactivation of procedural memory.

By analyzing the correlations between flow and self-regulation, the data suggest that the more self-regulated subjects are able to experience greater pleasure from the execution, also show a greater control of the situation and increased concentration on the task. Depending on the instrument used, self-regulation is strongly present in the pianists which reveals a wide correlation with the dimension D5 that is with concentration on the task (.47 **) and with the D6, sense of control (.39 **).

Among performers of string and wind instruments flow and the self-regulation are not related, so for these the experience of involvement shall be released from the exercise of control and maximum focus on. Among vocal performers self-regulation is strongly correlated (.63 **) with the dimension D4 that is the receipt of direct and immediate feedback and with the dimension D9 (autotelic experience). So for the mostly self-regulated vocal performers appears to be important the ability to understand all the signals coming from the environment, leading to a greater propensity to take pleasure from the experience. In absolute terms, the more self-regulated appeared to be vocal performers (average 83.7), followed by pianists (82.63), musicians of wind instrument (80.50), and finally by the musicians of stringed instrument (80.11).

From the data, it became clear that the negative emotional induction, even if carried out after the musical performance, affects their judgment; in fact, the group subjected to the experimental condition evaluated his performance so much lower than the subjects who underwent positive emotional induction. This conditioning is clear also analyzing the correlations between self-report of subjects and judgment of teachers; in fact, while the self-report of the positively induced subjects were strongly correlated with ratings of the teacher, self-assessments of negative induced subjects were released from the judgment of the teachers. This may confirm an alteration of the judgment downwards freeing itself from an objective and faithful to reality consideration.

Contrary to what one would expect, years of experience, while results in better performance levels, does not constitute an advantage in emotional management. In fact, what seems able to protect individuals from emotional conditioning turn out to be the mental strategies used to manage the emotional burden associated with the task. They reflect a mental organization able to recognize the source of emotions and able to compartmentalize them (almost creating a sealed room), preventing the emotion of invade neighboring experience and alter its valence but well distinguishing the
contexts (which reflect a different experience). This has been verified both in positive and negative stimulus condition, where the subjects using mental strategies, they showed better emotional control, proof of a mental self-regulatory mechanism capable of filtering the experiences on the basis of a clear and distinct causal attribution.

Conclusion

The study found that the type of instrument used affects the levels of flow, but the vocal performers manifest comparatively higher levels of flow. Self-regulation and flow are strongly correlated among pianists and vocal performers. The emotional induction affects the self-evaluative judgment. The years of experience in the practice of music, while results in better performance levels, does not constitute an advantage in emotional management. The use of mental strategies is associated with the formulation of more realistic judgments, with a better protection and management of interfering emotions.

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References


Applying the Gricean Maxims to Communication in Visual Art

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Abstract
A positive aesthetic experience arguably concerns the ability of viewers to construct meaning. But why is art viewing an arena for meaning making? We propose meaning construction happens because art viewing is seen as entering into a kind of conversation with the artist through the work of art itself. We apply a model of verbal communication, the Gricean “cooperative principle” and its four maxims, to visual art. We argue that this model may explain common, qualitatively different, responses to art via assumptions that the artist is either adhering, intentionally violating, or purposefully opting out of the conversation with the viewer. This perspective explains the differential experiences art-trained and non-art-trained individuals have of abstract and conceptual art.

Keywords: art preferences, Gricean model, communication, meaning making.

Introduction
A viewer’s ability to construct meaning from a work of art is often regarded as a significant contributor to aesthetic value (Dissanayake, 1988; Donald, 1991; Humphrey, 1999; Lewis-Williams, 2002; Landau, Greenberg, Solomon, Pyszczynski, & Martens, 2006; Ramachandran & Hirstein, 1999; Russel, 2003). Many avenues to meaning construction in art have been proposed, including the use of titles, the history of the work, artists’ biographical information, and viewers’ relating personal and felt experiences to the images. Notably, another arena for meaning construction is verbal communication. Everyday conversation involves a dynamic whereby meaning is constructed following the implicit assumption that both parties intend to be understood. Similarly, the experience of viewing art may be understood as entering into a kind of communicative exchange with the artist, via the artwork itself. If so, then the phenomena of communication and meaning-making through viewing artworks may be understood via some of the same rules governing human conversation.

The constructs of art and communication have been linked in a variety of ways by researchers and scholars across disciplines. For instance, philosopher John Dewey (1932) and Johnson (2007) focused on meaning construction being possible from shared experience and communicated through art, art historian E. H. Gombrich (1972), pursued the idea of art as a language, neuroscientists Ramachandran and Hirstein (1999) contending that artists use visual principles to excite our visual systems, in the process communicating or evoking an emotional response in their viewers, and artists themselves have also commented on the general importance of communication in art. Artist Eric Fischl commented on his sculpture, Tumbling Woman, “I was trying to say something about the way we all feel” (see Junod, 2009). Arthur Ganson (2004) stated, “I would go into these private places, and I would put my ideas and my passions into objects...sort of learning how to speak with my hands.”

Art can communicate shared experiences and can therefore communicate meaning. If art is a form of communication it is theoretically plausible to apply an existing framework of verbal communication to understand how art may communicate. Among various extant models of verbal communication (for a review, see Krauss & Fussell, 1996), here we focus on the Gricean maxims (Grice, 1975) as a particularly useful model for visual art. Current models of human conversation have deep roots in the work of Paul Grice. Here we propose to apply them as a means to understand common, qualitatively different responses to non-representational art.

Grice (1975) proposed that successful communication involves cooperation among interlocutors. This is summarized in his Cooperative Principle: people converse with the assumption that both are adhering to the cooperative principle, uttering words that have an intended meaning and that are uttered in a way that is assumed to be understandable.

Grice elucidated the Cooperative Principle with four specific maxims of communication. The maxims are rules that conversational partners obey, intentionally don’t fulfill, or possibly violate. The maxims provide expectations for communication, or ways to disambiguate a speaker’s intended meaning from the words actually uttered.

The adherence to, or purposeful violation or nonfulfillment of, Grice’s principles of communication may produce what experts and professionals consider “good art.” If an artist adheres to the maxims, the product should be a well-organized, balanced, complex composition, with the best possible arrangement of elements and use of materials to represent an intended idea, thought, or emotion. Arguably, high-quality artworks are those that follow communication principles or purposefully violate them in a way that still clearly and richly communicates.

How might the Gricean maxims apply to communication in art? Here we introduce the four Gricean maxims in an order that may be most intuitive in their application to art. The maxims are Relation, Manner, Quality, and Quantity.
Maxims

Relation
The maxim of Relation in verbal discourse dictates that interlocutors assume that utterances are intended to be relevant to them at that point in the conversational exchange. In art viewing the maxim of Relation would suggest that it is critically important that viewers believe that the artist intends a work to be relevant to them. Relation can take many forms, for instance, commentary on social issues (e.g., economics, war, or race), aesthetic issues, or at a purely individual level. In any case, the key issue is that over and above whether a piece is deemed personally relevant, people will appreciate art more to the degree that they believe it was intended to be relevant to them. Indeed, empirical evidence indicates that an individual’s ability to relate experience to the content in art impacts aesthetic preference ratings. For instance, Landau et al. (2006) asked participants to either imagine a chaotic life experience or a calm one and showed them abstract art that related to these themes; those who could relate personal experience to the images showed higher appreciation. More generally, these researchers argued that highly abstract art can threaten meaning when the content is difficult to interpret, consistent with the idea that fulfillment of the relevance maxim strongly influences aesthetic preference.

Manner
A second maxim, Manner, relates more to how something is said rather than what is said. Maxims under the category of Manner are: avoid obscurity of expression, avoid ambiguity, be brief, and be orderly (i.e., express yourself clearly). The Gricean category of Manner can also be intuitively related to art-viewing. One can interpret Manner as the ‘how’ of art-making. Again the key point is the degree to which viewers tacitly assume that the manner of the art is intended to be understood. A key aspect of Manner involves how an image is put together – that is, how the elements of the image are arranged. For instance, compositional balance is a primary design principle that is intimately linked to pleasurable aesthetic experience (e.g., Arnheim, 1974, 1988; McManus, Cheema, & Stoker, 1993). A large empirical literature has yielded substantial evidence supporting the notion of ‘visual rightness’ – that is, that high-quality artworks involve an optimal arrangement of visual elements (e.g., McManus & Kitson, 1995). Notably, violations of visual rightness can also function communicatively: an artist intending to induce a feeling of discomfort and unease may create a composition that purposefully upsets the balance structure so the work appears off-kilter. More generally, abstracted images that represent purposeful violations of Manner (or other Gricean categories) may communicate different way of looking at the world – at least to receptive viewers.

Quality
The third maxim of Quality in verbal discourse is the rule of truthfulness; it assumes that interlocutors’ utterances are intended to be truly intelligible – that is, that one is truly intended to understand what the speaker means at that point in the conversation. Individuals in conversation should not state something that they know to be false or for which they lack adequate evidence.

The Gricean category of Quality, in a visual art context, can refer to an artist’s depictive skill or the sincerity of the artist to communicate. One can easily imagine an artist using all of their knowledge and working with great sincerity to create an image that demonstrates their technical skill and communicates a straightforward message. Indeed, for much of art history this probably has been the norm (Gombrich, 1968). In recent times, one of the clearest violations of the truthfulness maxim involves abstract paintings, where there is often no discernible subject at all. Non-experts tend to show strong preferences for representational, as opposed to abstract, styles of art (Leder, Belke, Oeberst, & Augustin, 2004). Importantly, non-expert criticisms of abstract art (“my child could paint that”) don’t appear as detached criticism; instead, the disapproval is often very emotion-laden. In such cases, artists’ sincerity to communicate through their skillfulness in selection and manipulation of materials (if not the photographic realism of their depictions) does not enter viewers’ awareness and therefore leads to negative aesthetic emotions and judgments. In contrast, art-trained viewers share common ground with artists. They are familiar with the methods, techniques, styles, and media that are employed by the artists to communicate their experiences, as well as being familiar with the styles that preceded the development of new work. Thus, expert viewers are in a position to appreciate purposeful violations of Quality, while non-experts are not.

Quantity
Finally, the maxim of Quantity refers to the amount of information that is necessary to be maximally informative in discourse. In art, this involves an appropriate degree of visual or conceptual complexity: a piece needs to be complex enough to hold viewers’ attention and interest, but not so complex that a viewer finds it difficult to understand. A large literature has examined overall relations between visual complexity and aesthetic preference (e.g., Avital & Cupchik, 1998; Berlyne, 1971). However, from a Gricean perspective, more relevant is the interaction between the level of complexity and a viewer’s expectations, filtered through knowledge of an artist’s intentions. As with Quality, expertise probably plays an important role here, for instance, in some viewers’ capacity to appreciate seemingly simple paintings by Color Field Abstract Expressionists or Minimalists because they understand the artists’ intentions. The same logic probably applies with even more force to highly conceptual art and found objects exhibited as art.

Conclusion
All of the Gricean maxims assume that speakers want and intend to be understood. However, communication occurs not only when the maxims are followed, but also when they are purposely violated or unfulfilled. Indeed, it is because people largely assume they are in operation that apparent violations are nevertheless usually interpreted as if they have not been
flouted. The sharing of common ground with the discipline could help elucidate the differences in artist and non-artist preferences; artists can see intentional nonfulfillment of maxims while those non-trained see violations. The current work focuses on developing a measurement tool to assess the degree of perceived communication of artworks and how that contributes to outcome measures such as liking.

If the Gricean maxims are a plausible framework for understanding communication in art, and violations of the maxims are responsible for negative aesthetic experiences and emotions, it should be possible to reverse this effect and increase aesthetic liking by providing non-art-trained viewers with information to facilitate enough common ground with the artists’ intentions to be able to interpret the art as operating within the normal rules of cooperative communication. Indeed, a number of empirical studies (e.g., Landau et al., 2006; Russell, 2003; Cupchik et al., 1994; Seifert, 2001) provide strong hints that this is the case. The Gricean maxims provide one framework for understanding the structure of this dynamic. Relating the sorts of effects found so far in the empirical literature to particular maxims remains a methodological and measurement challenge. However, the maxims themselves (as they pertain to visual art) can be operationalized rather straightforwardly, and issues like their internal consistency, inter-correlations, and predictive validity (for outcomes like aesthetic preference or aesthetic judgment) are empirical questions. For instance, are all of the maxims equally amenable to measurement? Are all of the maxims equally predictive of, say, aesthetic preference, or are some more vital than others? Does the relative predictive power of the maxims vary as a function of the degree of abstraction of the image?

Firming up the pervasive but relatively vague notion of art as a means of communication will require not only methodological ingenuity, but a strong and sophisticated theoretical perspective, like the Gricean maxims. There is every reason to think that this combination will enable more detailed predictions and assessment of what happens as common ground between artists and viewers is established, and the communication process unfolds.

References

Personality Intuition Type and Divergent Thinking

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Abstract
We hypothesized that at the level of observed variables the Intuition, Extraversion, Feeling, and Perceiving personality dimensions positively correlate with divergent thinking. At the level of latent variables Extraversion, Feeling, and Perceiving mediate paths from Intuition to divergent thinking. Raw data were gathered from a sample of 260 participants recruited from Perm Universities (Russia). The personality dimensions were assessed by the Myers-Briggs Type Indicator and divergent thinking the Alternate Uses Test. Correlation analysis revealed that participants who score higher in intuition and lower in extraversion facilitate divergent thinking. Using a structural equations methodology a chain was found consisting of latent variables with paths from Intuition to Extraversion to divergent thinking.

Keywords: Personality intuition type; personality extraversion type; divergent thinking; immediate and mediational models.

Introduction
The view that creativity is a syndrome is broadly accepted (e.g., Eysenck, 1995; Martindale, 1999; Mumford & Gustafson, 1988; Runco, 2008). It includes a number of requirements, in particular, divergent thinking, intuition, and personality traits. The present paper develops an empirical model of divergent (creative) thinking based on the personality intuition dimension.

Most conceptualizations of intuition include nonconscious information processing, holistic associations, affect, and speed (e.g., Dane & Pratt, 2009). By "intuitive" Simonton (1980) means behavioral adaptations to the environment which tend to be unconscious, ineffable, and essentially probabilistic in character. Eubanks, Murphy, and Mumford (2010) suggest that intuition involves the formation of an inarticulate, unconscious pattern that guides problem-solving and decision making in complex tasks. Intuitiveness may either be a personality trait or a cognitive style (e.g., Cheng, Kim, & Hull, 2010; Myers et al., 1998; Simonton, 1980). In their turn, some cognitive studies of creativity focus on divergent thinking ( Guilford, 1967). It is a cognitive process that goes in various directions and contributes to finding original ideas with the ability to think of diverse valuable alternatives to a novel situation. Notably, divergent thinking is neither synonymous with nor sufficient for creativity. Divergent thinking is a potential because it does not equates with actual creativity and creative behavior. Divergent thinking is a kind of creative thinking and has its own worth (Runco, 2008). Usually, divergent thinking is assessed through fluency, originality, and flexibility.

If creativity and intuition are related, then an emphasis may be given to their common basis. Simonton (1980) has suggested that a low arousal level is one of the determinants of intuition, a function of the objective information content of the environmental stimuli and the individual's position along the intuitive personality dimension. As for creativity, Eysenck (1995) and Martindale (1999) have contended it as a disinhibition (reduced inhibition) syndrome characterized by low cortical arousal, a state of defocused attention, and a flat associative gradient. Carson, Peterson, and Higgins (2003) reported findings according to which decreased latent inhibition associates with increased creative achievement in high-functioning individuals. Kaufman (2009) found that faith in intuition links to decreased latent inhibition in a sample of high-achieving adolescents. This would enable the concept of decreased latent inhibition (or disinhibition) that generally was deemed relevant to the problem of the common basis for creativity and intuition.

Simonton (1980) cites evidence that intuitiveness may be a personality trait of creative individuals. Policastro (1995) has introduced the construct of creative intuition to emphasize that creativity and intuition can be combined. She points out four sources of evidence—autobiographical testimonies, historical evidence, psychometric assessment, and experimental studies. These sources taken together, she argues, maintain the notion of creative intuition which is coherent, well-grounded, and empirically testable. Within the psychometric approach, Policastro (1995) cites numerous studies that point out a strong predominance of intuitive types among highly creative individuals such as mathematicians, architects, research scientists, and writers.

However, combining intuition and creativity can lead to their confounding which would further complicate examination of their relationships. It might be better to consider them as distinct constructs. We develop this framework suggesting that intuition and creativity consistently co-vary presenting decreased latent inhibition as their common underlying condition. Yet we keep in focus the fact that intuition and creativity substantially differ.

Two basic research questions arise from the above considerations. The first is the direction: does intuition facilitate creativity or, vice versa, is creativity a condition for intuition? The second is the mediation: are there mediators between intuition and creativity? The objective of
our study is to test these research questions in relation to the personality intuition dimension and divergent thinking.

Background

Jung’s Theory of Types and Its Operationalization

The personality intuition type was conceptualized within Jung’s (1971) theory of types. Jung deemed that their differences arise out of different ways of perceiving the world. Davis and Mattoon (2006) argue that Jung’s term “types” actually means attitudes and functions as personality dimensions. Jung’s theory has been operationalized; in particular, using the Myers-Briggs Type Indicator (Myers et al., 1998) as a tool for measuring individual differences.

As Davis and Mattoon (2006) highlighted, Jung specified attitudes labeling them “extraversion” and “introversion.” The extraverted attitude is directed toward the outer world, events, people and things, and relationships with them. The introverted attitude is directed inwards focusing on the subjective world and inner responses. Further, Jung showed that some people primarily perceive the world through sense impressions and their characteristics, namely, the “sensation function.” Other people focus their perceptions on possibilities and connections—the “intuition function.” A person with a dominant sensation function is interested in facts and things, that is, in objective reality. A person with a developed intuitive function perceives patterns of relationships and is interested in possibilities via the unconscious. Besides, Jung specified the “thinking function” and the “feeling function.” The former emerges if some people assess their perceptions through analytical processes and meaning, the latter if the others prefer value, the object's desirability and degree of importance. A person with a developed thinking function is able to analyze cause and effect, distinguish alternatives, and reason objectively. A person with a dominant feeling function can evaluate and judge worth. In addition, Cheng, Kim, and Hull (2010) have drawn attention to the judging and perceiving functions. Judging people prefer to plan and organize their life, whereas perceiving people tend to like a flexible and spontaneous life keeping their options open. Ultimately, Jung's typology of attitudes and functions reveals the interplay of the opposites.

Notably, the Myers-Briggs Type Indicator (MBTI; Myers et al., 1998) has been characterized as tending to indicate a more holistic type of intuition. There can be other aspects of intuition. Pretz and Totz (2007) used Epstein’s Rational-Experiential Inventory (Pacini & Epstein, 1999) and the Intuitive/Sensation and Thinking/Feeling subscales of the MBTI. The former relied more on gut feelings and instinct. On the whole, Pretz and Totz contended individual differences in affective, heuristic, and holistic intuition. Kaufman (2009) emphasizes the open question of whether different aspects of intuition will show the same relationship with latent inhibition and divergent thinking.

Empirical Studies Of The MBTI Subscales And Creativity

There is evidence that the MBTI intuition and perceiving, especially if they are combined, relate to creativity (Myers et al., 1998). Cheng, Kim, and Hull (2010) used Keirsey Temperament Sorter II which is closely related to MBTI and Torrance Test of Creative Thinking-Figural Form A. They established similar findings. Significant correlation coefficients were found between the MBTI Intuition and Torrance’s Originality, Abstractness of the Titles, Elaboration, and Creative Strengths, and between the MBTI Perceiving and Torrance’s Abstractness of the Titles and Creative Strengths. These results suggest that the intuitive and/or the perceiving personality dimensions may be more favorable to creativity than the sensing or the judging personality dimensions.

However, Dollinger, Palaskonis, and Pearson (2004) reported findings which are to some extent inconsistent with these data. They used the MBTI and a variety of validated creativity measures to examine the MBTI subscales as predictors of creativity. Results indicated that the combination of intuition and feeling best characterizes a composite creativity measure. Kaufman (2009) found that the MBTI Intuition and Feeling subscales correlate with decreased latent inhibition. Then they might link to creativity. When the MBTI and Rational-Experiential Inventory (Pacini & Epstein, 1999) subscales were jointly factor analyzed, the MBTI Intuition factor did not relate to decreased latent inhibition. But faith in intuition, as assessed by the MBTI Thinking/Feeling subscale, did associate with decreased latent inhibition.

Some data give evidence that the MBTI Intuition can relate to creativity indirectly, through intermediate personality variables. In a study conducted by McCrae and Costa (1989) correlations were presented between the MBTI subscales and Big Five personality scales. They have reported that the MBTI Extraversion/Introversion and Intuition/Sensation strongly relate to Big Five Extraversion and Openness to experience, respectively. Openness to experience in turn is associated with divergent thinking (McCrae, 1987).

Research Hypotheses

All these efforts notwithstanding, we certainly cannot conclude that research has exhausted the topic. Besides, there is some lack of convergence in results reported in the literature about relationships between personality dimensions measured by the MBTI and creativity. Thus, additional research into this relationship is required.

To examine basic research questions denoted in the introduction, we put forward several research hypotheses. (1) At the level of observed variables the MBTI Intuition, Extraversion, Feeling, and Perceiving positively correlate with divergent thinking. (2) At the level of latent variables the MBTI Intuition facilitates divergent thinking but the MBTI Intuition is not conditional on divergent thinking. (3) The MBTI Extraversion, Feeling, and Perceiving mediate the
paths from the MBTI Intuition to divergent thinking but the reverse path does not arise.

**Method**

**Participants**

Raw data were gathered from a sample of 260 participants recruited from Perm Universities, Russia (148 men and 112 women). Age ranged from 18 to 20, M = 19.40, SD = .82. Participants received no reward or compensation for taking part in the study.

**Materials and Procedure**

Participants completed paper-and-pencil tests in a number of group sessions.

**Paper-and-Pencil Tests**

Personality dimensions (Intuition/Sensation, Extraversion/Introversion, Feeling/Thinking, Perceiving/Judging) were measured using the MBTI (Myers et al., 1998). Divergent thinking (DT) was measured using the Alternate Uses Test (Wallach & Kogan, 1965).

**The MBTI**

To assess personality dimensions, participants completed the MBTI. This questionnaire was adapted in Russian by Abelskaya (2006). The MBTI is a 94-item self-administered forced-choice (yes/no answers) questionnaire that measures individual preferences. The MBTI includes four subscales in relation with the foregoing personality dimensions. Based on the answers to the questions on the questionnaire, scores on each subscale were computed for each participant.

**The Alternate Uses Test**

To assess DT, participants completed the Alternate Uses Test (Wallach & Kogan, 1965). This test was adapted in Russian by Averina and Scheblanova (1996). The Alternate Uses Test involves generating as many uses as possible for three regular objects (brick, newspaper, pencil). Participants were allowed 3 minutes per object. The final data consisted of three measures. Fluency is the total number of uses generated across the three objects. Flexibility is the total number of categories from which the uses were drawn. Originality was scored according to the score system offered by Dorfman et al. (2008). The rarest response receives the highest rank, and the most frequent the lowest rank. The overall originality score was the total of the originality scores for each use provided by the participant. A composite measure of DT was computed across fluency, flexibility, and originality converting them to z-scores and yielding an average standard score. All scores were computed for each participant.

**Data Analysis**

Extreme values on each variable (beyond X ± 2 SD) were excluded; missing data were replaced with mean scores. After outliers were removed each variable had normal distribution (Kolmogorov—Smirnov test, D-max statistic).

At the level of observed variables, Pearson correlation analyses were conducted between the MBTI subscales and DT measures. Correlations were also computed separately among the MBTI variables and among DT variables.

At the level of latent variables, correlation matrices for manifest variables were submitted to structural equation modeling using SEPATH module in Statistica software package (Steiger, 1995). Composite models were used. They specify both measurement relations between observed and latent variables (confirmatory factor analysis) and relations among the latent variables, that is, the structural equation modeling as such (e.g., Tomarken & Waller, 2003).

Two kinds of models were employed. The first kind presented the immediate models, the second kind the mediational ones. The immediate models relied on the target and alternative reverse models. The mediational models were employed under the condition that the target model did not provide a better fit to the data (e.g., Frazier, Tix, & Barron, 2004). The mediational model highlights a chain according to which X (a distal latent exogenous variable) relates to Y and Y (a proximal latent mediator variable) to Z as a latent endogenous variable. By doing this, Y is dependent on X yet independent of Z. Similar to the immediate models, the mediational model analysis relied on the target and alternative reverse models. Note that the mediation analysis in our study did not examine causal relationships.

The immediate models were intended to compare three submodels. The measurement submodel \( IM_0 \) is based on confirmatory factor analysis. It involved the MBTI Intuition and the composite DT latent variables as non-correlated. Within the structural equation modeling, the target \( IM_1 \) and reverse \( IM_2 \) submodels were specified. The target submodel involved the MBTI Intuition subscale as an exogenous variable and the composite DT as an endogenous variable. The opposite sequence arises from the composite DT as an exogenous variable to the MBTI Intuition subscale as an endogenous variable. They refer to the reverse submodel. Each estimated construct was defined by three indicators, and each indicator was intended as an estimate of only one construct. Given this, Fluency, Flexibility, and Originality indicated the composite DT latent variable. In each submodel, structural paths among latent variables were estimated.

The mediational models were designed to compare five submodels. The measurement submodel \( 2M_0 \) included the MBTI Intuition, Extraversion, Feeling, Perceiving subscales and the composite DT latent variables. Again, each estimated construct was defined by three indicators, and each indicator was intended as an estimate of only one construct. Within the structural equation modeling, subsequent four mediational submodels were based on the measurement model data.

The mediational reverse submodel \( 2M_1 \) involved the composite DT serving as an exogenous variable, Extraversion as a mediator variable, and Intuition as an
endogenous variable. The mediational reverse submodel $2M_2$ involved the composite DT serving as an exogenous variable, Perceiving as a mediator variable, and Intuition as an endogenous variable. The mediational target submodel $2M_3$ involved Intuition serving as an exogenous variable, Perceiving a mediator variable, and the composite DT as an endogenous variable. The mediational target submodel $2M_4$ involved Intuition serving as an exogenous variable correlated with Perceiving, Extraversion as a mediator variable, and the composite DT as an endogenous variable. In each mediational submodel, structural paths among latent variables were estimated.

For each submodel the method for discrepancy function estimation was Generalized Least Squares with standard errors. The line search method was Cubic Interpolation. Five indices were used to assess model fit: Steiger and Lind's root mean square error of approximation (RMSEA), the goodness-of-fit index (GFI), the adjusted goodness-of-fit index (AGFI), chi-square statistic, and chi-square/df ratio (e.g., Schermelleh-Engel, Moosbrugger, & Müller, 2003). The chi-square difference test (Bentler, 1990) was used to compare models.

**Results**

**Correlation Analysis**

Correlations were computed among the DT measures. All of the variables positively correlated with one another at $p < .001$. The highest correlation was between the composite DT and fluency ($r(258) = .94$), flexibility ($r(258) = .93$), and originality ($r(258) = .90$) scores. Similarly, fluency and flexibility scores were correlated (.92). Fluency and originality scores were correlated (.84). Flexibility and originality scores were also correlated (.79).

Correlations were computed among the MBTI subcales. The Intuition subscale and the Extraversion subscale scores negatively correlated ($r(258) = .13, p < .05$). The Intuition subscale score positively correlated with both the Feeling subscale ($r(258) = .35, p < .001$) and the Perceiving subscale ($r(258) = .29, p < .001$) scores. The Perceiving subscale score negatively correlated with the Extraversion subscale ($r(258) = -.16, p < .01$) and positively with the Feeling subscale ($r(258) = .22, p < .001$). No significant correlations were found among the Extraversion and the Feeling subscale scores.

Though not especially high, the MBTI Intuition subscale and the DT (fluency, flexibility, originality, and composite DT) measures positively correlated in the predicted direction ($r(258) = .12\pm.14, p < .05\pm.01$). The higher the Intuition the higher the DT and its constituents were. Thus, our prediction is upheld, but the effect is a fairly weak one.

Surprisingly, correlations of the MBTI Extraversion subscale and the DT (fluency, flexibility, and composite DT) measures were negative though significant. They were rather low ($r(258) = -.11\pm.13, p < .05$). The less the Extraversion the greater the DT fluency, flexibility, and composite DT were. Thus, our hypothesis is supported to their relation but does not hold true to the predicted direction. Originality did not correlate with Extraversion ($p > .05$).

The MBTI Feeling and Perceiving subscales did not significantly correlate with the DT and its constituents ($p > .05$).

**Mediation Models**

**Measurement Submodel.** It represented a good fit to the data; $\chi^2(9) = 10.80, p > .05, \chi^2/df = 1.20, \text{RMSEA} = .03, \text{GFI} = .99, \text{AGFI} = .97$. The MBTI Intuition and the DT latent variables (not correlated) entered the measurement model. There were nonsignificant direct effects from the MBTI Intuition to the composite DT ($p > .05$). The reverse model fit the data well. Fit indices were the same as those of the target model. The composite DT as an exogenous variable and the MTBI Intuition as an endogenous variable entered the reverse model. Each latent variable was indicated by three manifest variables at $p < .001$. There were nonsignificant direct effects from the composite DT to the MTBI Intuition ($p > .05$).

**Structural Submodels.** The target model fit the data well: $\chi^2(8) = 9.99, p > .05, \chi^2/df = 1.25, \text{RMSEA} = .03, \text{GFI} = .99, \text{AGFI} = .97$. The MBTI Intuition as an exogenous variable and the composite DT as an endogenous variable entered the target model. Each latent variable was indicated by three manifest variables ($p < .001$). There were nonsignificant direct effects from the MBTI Intuition to the DT latent variables ($p > .05$). The reverse model fit the data well. Fit indices were the same as those of the target model. The composite DT as an exogenous variable and the MBTI Intuition as an endogenous variable entered the reverse model. Each latent variable was indicated by three manifest variables at $p < .001$. There were nonsignificant direct effects from the MBTI Intuition to the DT latent variables ($p > .05$). It was removed from the subsequent analyses.

**Structural Submodels.** The submodel $M_1$ demonstrated poor fit: $\chi^2(54) = 147.77, p < .001, \chi^2/df = 2.74, \text{RMSEA} = .08, \text{GFI} = .90, \text{AGFI} = .86$. The submodel $M_2$ showed a better fit but still not sufficiently acceptable: $\chi^2(54) = 123.80, p < .001, \chi^2/df = 2.29, \text{RMSEA} = .07, \text{GFI} = .92, \text{AGFI} = .88$. Similarly, the submodel $M_3$ was still not acceptable: $\chi^2(53) = 120.76, p < .001, \chi^2/df = 2.28, \text{RMSEA} = .07, \text{GFI} = .92, \text{AGFI} = .89$. The submodel $M_4$ represented a good fit to the data: $\chi^2(52) = 96.65, p < .001, \chi^2/df = 1.86, \text{RMSEA} = .06, \text{GFI} = .94, \text{AGFI} = .91$. Overall, this submodel fit the data better as compared to the previous model.

Further, we compared the submodels using a special statistical measure, $\chi^2$ difference test. The submodels $M_1$ and $M_2$ did not differ from the measurement submodel, $M_0$ ($\Delta \chi^2(36, N = 260) = 9.25, p > .05$). The submodels $M_1$ and $M_2$ were not comparable because they had equal $df$ ($df_i = 54, df_j = 54$). The submodel $M_3$ fit the data slightly better than the
model M2 ($\Delta F^2 (1, N = 260) = 3.04, p < .08$). The submodel M3 fit the data significantly better than the submodel M2 ($\Delta F^2 (1, N = 260) = 3.04, p < .001$). Thus, the submodel M3 was more probable than the preceding submodels.

**Structural Paths**

In the model M4, the Intuition exogenous variable included 2 manifest variables ($p < .05$) of the three. The Perceiving exogenous variable included 3 manifest variables ($p < .001$) of the three. The Extraversion mediator variable included 3 manifest variables ($p < .001$) of the three. The composite DT endogenous variable included 3 manifest variables ($p < .001$) of the three.

Parameter estimates revealed statistically significant positive path coefficients from Intuition to Extraversion (1.00, $p < .001$) to the composite DT (.17, $p < .05$). Contrary to expectations, the Intuition and the Perceiving variables did not correlate (.13, $p > .05$). A path diagram is shown in Figure 1.

![Path diagram](image)

Figure 1: Path diagram for the MBTI intuition, extraversion, perceiving and composite DT latent variables.

*Note: I = Intuition, P = Perceiving, E = Extraversion, D = composite DT; ns = nonsignificant latent variable correlation; arrows indicate significant paths, arc indicates correlations between latent variables; manifest variables are omitted.

* $p < .05$, ** $p < .001$.

**Discussion**

Supporting our prediction, correlation analysis revealed that the MBTI Intuition facilitates DT. Contrary to our prediction, rather than facilitating, the MBTI Extraversion inhibited DT. Surprisingly, no significant correlations were found between DT variables and the MBTI Feeling and Perceiving dimensions.

When the structural equations methodology was used to test the immediate models there was a nonsignificant direct effect from the MBTI Intuition to the composite DT. There was also a nonsignificant direct effect for the reverse direction.

In regard with mediational models, the submodel $2M_1$ only showed acceptable fit indices. A chain was found consisting of latent variables with paths from Intuition to Extraversion to the composite DT. This finding supports our prediction. But the MBTI Feeling dimension was removed from the mediational analysis in accordance with the data of the measurement submodel. The MBTI Perceiving dimension entered the submodel $2M_3$ but did not significantly mediate the paths from the MBTI Intuition to the composite DT. These findings do not support our hypothesis. As predicted, the reverse mediational submodels were not acceptable.

Note that a correlation analysis of observed variables and a path analysis of latent variables differ to some extent.

Based on the correlational results we apply the notions of insight and incubation. Simonton (1980) calls attention to a sudden "flash of insight" related to intuition and Martindale (1999) to creative insight. Besides, they mention the creativity “incubation period” which precedes insight. Although creativity phenomena do not coincide with intuition (Policastro, 1995) both would substantially have an easier access to each other through insight and incubation. Supposedly, a reason for intuition and creativity to be related is that the insight and incubation can be their common basis.

At the level of latent variables, additionally, our findings reveal that the MBTI Intuition enables the composite DT indirectly, that is, through the MBTI Extraversion. This would mean that taken conjointly they represent a unified chain. Here, Intuition serves as a distal variable, Extraversion as a proximal variable and both relate to the composite DT variable. Besides, the MBTI Extraversion operates as a mediator between the MBTI Intuition and the composite DT. It is plausible that the MBTI Extraversion can be a ground for composite DT becoming conditional on the MBTI Intuition. The MBTI Extraversion would hold properties close to both the MBTI Intuition and the composite DT.

Besides, we draw attention to decreased latent inhibition. It can be a common ground for our data, although this suggestion is to some extent speculative. We suppose that different levels of decreased latent inhibition are just one of the possible sources due to which intuition and DT differ. Tentatively, intuition refers to deeper levels of decreased latent inhibition whereas its more surface level would be substantial for the DT. The proposed assumption allows to study either a common origin or differences between intuition and DT. This is a direction for further research.

Our findings should be tempered with certain limitations. The MBTI subscales are still scrutinized and need improvement to increase their reliability. We suggest that a forced-choice format of the MBTI can be replaced with the 5-point or 7-point Likert scales for a more subtle discrimination of participants’ responses. The data obtained should be restricted by the personality dimensions of Jung’s (1971) theory of types and the MBTI DT is in turn restricted by Guilford’s (1967) theory. The question is open whether other theories and instruments will lead to similar findings. We emphasize that the MBTI relates to a holistic aspect of intuition. It is not evident that our findings will be replicated in respect with individual differences in other aspects of intuition. In addition, the results with participants from Russian culture should be verified on those from other cultural domains.

**Conclusion**

Relationships between the MBTI personality dimensions and DT were examined. At the level of observed variables
correlation analysis revealed that DT positively correlates with the MBTI Intuition and negatively with the MBTI Extraversion. At the level of latent variables, no direct effects were found from the MBTI Intuition to the composite DT, as well as direct effects in the opposite direction. Mediational models allowed to show a chain with the paths from Intuition to Extraversion to the composite DT. We claim that Intuition enables DT indirectly, that is, through Extraversion. It is plausible that Intuition serves as a distal latent variable and Extraversion as a proximal latent variable in relation to the composite DT.

References
The Value of Making It By Hand

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Abstract
We compared 71 8-12 year olds’ experience of making a drawing by hand vs. on the computer. After inducing a sad mood, we randomly assigned children to: Draw Something Important, Draw a Design, or Play Solitaire. Each activity was completed once by hand and once on the computer. Children rated their mood before and after the activity and rated their enjoyment and perceived competence. After completing both activities, they were asked which one they preferred, and, for the two drawing conditions, which picture they valued more. Enjoyment was rated higher for the Important condition when drawing by hand and for the Design condition when drawing on the computer. Children preferred drawing by hand when drawing something important to them.

Keywords: computers; digital; enjoyment; drawing; mood regulation.

Introduction
Computer technology has invaded the arts and children’s experience of the arts is in many ways very different from the experience of those a generation earlier. The impact of digital technology has transformed the activity of drawing, painting, and photography. Computer drawing programs are typically advertised as ways to create drawings quickly, and without the mess of paints. We can scan in drawings made by hand and alter them in Photoshop; and we can make drawings directly on the computer. Has the digitalization of the arts affected children’s valuation of the drawing product?

Drawings by hand vs. on the computer differ substantially in the final product. A drawing done by hand is unique, whereas each digital print-out of a computer-made drawing is identical, and thus there is no “original” drawing. Given that in the art world, limited editions of etchings and lithographs are valued more than unlimited ones, it is reasonable to suppose that digital print-outs of drawings are not valued as much as are unique originals.

We know from the work of Newman and Bloom (2011) that adults value original artworks by an artist more than exact duplicates made by someone else. These evaluations seem to be influenced by the amount of physical contact that the artist has with his or her work. Works of art for which there was a high amount of physical contact between artist and artwork were rated as more valuable than those for which there was a low amount of physical contact. Thus, people may believe that a work of art has a special quality because the artist touched it. This suggests that children should value handmade drawings over printouts of digital drawings.

Such a hypothesis would be consistent with research showing that children are sensitive to the effects of positive contagion. When presented with a special object, such as their own security blanket, young children prefer the original blanket to a duplicate (Hood & Bloom, 2008). This finding extends to objects that did not belong to the child: children placed a higher value on a goblet said to have been owned by Queen Elizabeth than a duplicate goblet said to have been owned by an ordinary person (Hood & Bloom, 2008).

We asked children to compare the experiences of drawing by hand on paper vs. creating a drawing on a computer screen using a mouse. Our question was which experience and which product children would value more. We examined this question with two very different kinds of drawings: one in which children drew something important to them, and one in which they drew a design. We chose these two kinds of drawings with the hypothesis that it is particularly for drawings that are personally important to children that the medium will matter. We expected drawing by hand to be a more positive experience (greater enjoyment and perceived competence) when the image created was a personally important one.

Previous research has shown that after a negative mood induction, drawing improves short-term mood for both adults and children (Dalebroux, Goldstein, & Winner, 2008; DePetrillo & Winner, 2005; Drake, Coleman, & Winner, 2011; Drake & Winner, 2012; 2013; Pizarro, 2004), and we wondered whether drawing by hand would have a more positive mood effect than creating a digital drawing. And if so, would this be explainable by -- or independent of -- a more positive affective experience.
We included a control condition in which children were asked not to draw but to play a card game, either by hand or on the computer. The inclusion of a non-art activity allowed us to determine whether a more positive outcome for either or both of the drawing activities (hand vs. computer) was specific to art-making.

**Methods**

**Participants**

Participants were 71 children (42 girls) ranging in age from 8.7 to 12.3 years ($M = 10.7$ years, $SD = 1.0$) recruited from after-school art classes, summer camps, and online advertisements. The majority of the children were Caucasian. Children received a $20$ gift card to amazon.com and Faber-Castell water color pencils for participating.

**Materials & Procedure**

**Conditions.** Children were randomly assigned to one of three conditions: Important ($n = 25$), Design ($n = 23$), or Card Game ($n = 23$). There were no differences in gender distribution across conditions, ($X^2 = 1.628, p = 0.450$).

Instructions for the Important condition were: “I want you to draw something that is important to you.” Instructions for the Design condition were: “I want you to draw a design – don’t make a picture of something, just make a design. A design is a picture with a pattern of lines, colors, shapes, but it is not a picture of any kind of object in the world.” Instructions for the Card Game condition were: “I want you to play Solitaire using the cards (or mouse in the computer activity).”

Children in the drawing conditions completed the activity once by hand (using water color pencils) and once digitally (using Sumo Paint on a laptop), with order counterbalanced. Children were given up to a half hour to complete each task and the time that they spent was recorded as a measure of their persistence. Figure 1 shows a drawing by a 10-year-old of something important done by hand and on the computer; Figure 2 shows a design by an 11-year old done by hand and on the computer.

**Positive and Negative Affect Schedule-Child (PANAS-C).** In order to assess mood changes, we administered the Positive and Negative Affect Schedule-Child (PANAS-C) (Laurent, Catanzaro, Joiner, Rudolph, & Potter, 1999). The PANAS-C contains 30 words that describe different feelings and emotions. For each word, children were asked the extent to which they were feeling that emotion on a five-point scale ranging from 1 (very slightly or not at all) to 5 (extremely). The PANAS-C yields a global score for positive affect and negative affect.

**Mood Induction.** To induce a negative mood, we showed children a five-minute clip from either The Lion King or Bambi (order counterbalanced between sessions). After watching the film clip children were instructed: “Now close your eyes and think about something that has happened to you that made you feel really sad.” Children were given 30 seconds to think of the event. They were then asked to recall the event to the experimenter.

**Enjoyment and Competence.** After each activity, children were asked to rate on a 5-point scale “How much did you enjoy doing this?” from really didn’t like it to really liked it and “How well did you think you did on this?” from very bad to very good.

**Preference and Valuation of Final Drawing.** After children completed both the hand and computer activities, they were asked two preference questions: “Which way did you like best, by hand or on the computer?” “If you got the chance to do it again, would you do it by hand or on the computer?” Children in the two drawing conditions were also asked one more question that assessed which product they valued more. They were asked: “Which picture would you like to hang in your room?”

**Procedure**

At the beginning of each testing session, children completed a training session using the relevant materials: the water color pencils, the computer drawing software, the card game, or the computer card game software. Then they completed the PANAS-C (Time 1). Next they watched the mood induction film clip (The Lion King or Bambi with the order counterbalanced by session), were asked to recall a time
when they were sad, and completed the PANAS-C a second time (Time 2). Children then carried out their assigned activity. After the activity, children were given the PANAS-C a third time and were asked to indicate how they were feeling (Time 3). Finally, they were asked questions about their preference and valuation of their final drawings.

Children participated in two testing sessions that lasted between 30 to 45 minutes each, with order counterbalanced. One session was with the computer while the other session was the same activity by hand. The two sessions were scheduled on average one week apart.

Results

Preliminary Results

To determine whether positive and negative affect differed at Time 1, a MANOVA with order (computer/hand, hand/computer) and condition (3) as the fixed factors and Time 1 positive and negative affect as the dependent variables (4) was performed. There was no effect of order ($p > 0.05$) and no interaction of order by condition, ($p > 0.05$). There was no effect of condition ($p > 0.05$) with the exception of negative affect for the first session. A bonferroni post hoc test revealed that the Game condition was associated with a higher negative affect than the Design condition during the first session.

A paired sample t-test showed that the two mood inductions were both effective in inducing a negative mood. After the Lion King clip and the personal memory recall, children’s negative affect increased from Time 1 to Time 2 and their positive affect decreased from Time 1 to Time 2, (all $p$ values < 0.001). The same was true for the Bambi clip, (all $p$ values < 0.001).

Mood Improvement

To determine whether positive and negative affect differed as a result of the film clip children watched first or activity they performed first, a MANOVA with order (computer/hand, hand/computer) and film clip (2) as the fixed factors and Time 2 positive and negative affect as the dependent variables (4) was performed. There was no effect of order ($p > 0.05$), no effect of film clip, ($p > 0.05$), and no interaction of order by film clip, ($p > 0.05$). Thus, in subsequent analyses, order of activity and order of film clip were not included as factors. We next computed change scores (Time 3 minus Time 2) for negative and positive affect for each activity when carried out by hand and when carried out on the computer.

Negative Affect. Figure 3 presents mean negative affect change scores by condition and activity (hand/computer). A mixed design ANOVA with condition (3) as the between subjects factor and activity (hand, computer) as the repeated measures was performed on negative affect change score. There was no effect of condition [$F = (2, 68) = 0.911, p = 0.407, \eta^2_p = 0.026$], no effect of activity [$F = (1, 68) = 0.108, MSE = 24.896 p = 0.743, \eta^2_p = 0.002$], and no interaction of condition by activity, [$F = (2, 68) = 2.362, p = 0.102, \eta^2_p = 0.065$].

Positive Affect. Figure 4 presents mean positive affect change scores by condition and activity (hand/computer). A mixed design ANOVA with condition (3) as the between subjects factor and activity (hand, computer) as the repeated measures was performed on positive affect change scores. There was no effect of condition [$F = (2, 68) = 0.563, p = 0.572, \eta^2_p = 0.016$], no effect of activity [$F = (1, 68) = 0.509, MSE = 71.547, p = 0.478, \eta^2_p = 0.007$], and no interaction of condition by activity, [$F = (2, 68) = 2.529, p = 0.965, \eta^2_p = 0.001$].

Enjoyment

A mixed design ANOVA with condition (3) as the between subjects factor and activity (2) as the repeated measures was performed on enjoyment. There was an effect of condition [$F = (2, 68) = 11.334, p < 0.001, \eta^2_p = 0.250$]. Bonferroni post hoc tests revealed that children in the Important condition enjoyed their task more than children in the Card Game condition, ($p < 0.001$); and children in the Design condition enjoyed their task more than children in the Card Game condition, ($p < 0.001$).
condition, \((p = 0.001)\). There was no difference in enjoyment between the Important and Design conditions, \((p = 1.0)\). There was no effect of activity, \(F = (1, 68) = 0.704, \text{MSE} = 0.297, p = 0.404, n^2_p = 0.010\).

Most importantly for our hypotheses, condition interacted with activity, \(F = (2, 68) = 7.195, p < 0.001, n^2_p = 9.175\), as shown in Figure 5. Paired sample \(t\)-tests revealed that in the Important condition, children enjoyed the hand \((M = 4.48)\) more than the computer activity \((M = 4.08)\), \(t(24) = 2.449, p = 0.022\). In the Design condition, children enjoyed the computer \((M = 4.57)\) more than the hand activity \((M = 4.17)\), \(t(22) = 2.859, p = 0.009\). In the Card Game condition, there was no difference between enjoyment of hand \((M = 3.54)\) vs. computer activity \((M = 3.78)\), \(t(22) = -1.392, p = 0.178\).

Most Valued Final Product

Finally, a binomial test was run to determine whether children valued the hand or the computer activity more. For the Important condition, children said they would prefer to hang the hand-made rather than the computer-made drawing, \(0.80 \text{ vs. } 0.10, p = 0.012\). We also coded children’s reasons. The majority of children felt that the hand-made drawing looked better than the computer drawing (82%); the remainder said either that they enjoyed drawing by hand more or felt that the hand-made drawing was special because it was done all by themselves without the assistance of the

Perceived Competence

A mixed design ANOVA with condition \((3)\) as the between subjects factor and activity \((2)\) as the repeated measures was performed on perceived competence. There was an effect of condition, \(F = (2, 68) = 3.376, p = 0.040, n^2_p = 0.090\). Bonferroni post hoc tests revealed that children in the Design condition had greater perceived competence than children in the Card Game condition, \((p = 0.044)\). There was no difference in perceived competence between the Important and Design conditions, \((p = 1.0)\) or between the Important and Card Game conditions, \((p = 0.193)\). There was no effect of activity, \(F = (1, 68) = .023, \text{MSE} = 3.156, p = 0.880, n^2_p = 0.0\).

As with enjoyment, condition interacted with activity for perceived competence, \(F = (2, 68) = 3.156, p = 0.049, n^2_p = 0.085\), as shown in Figure 6. Paired sample \(t\)-tests revealed that in the Important condition children rated perceived competence marginally higher in the hand \((M = 4.06)\) than the computer activity, \((M = 3.72)\), \(t(24) = 1.893, p = 0.071\). In the Design condition, there was no difference in children’s perceived competence of the hand \((M = 4.0)\) vs. computer activity \((M = 4.04)\), \(t(22) = -0.272, p = 0.788\). In the Card Game condition, there was no difference in children’s perceived competence of the hand \((M = 3.35)\) vs. computer activity \((M = 3.70)\), \(t(22) = -1.447, p = 0.162\).

Preferred Activity

Binomial tests were run to determine whether children showed a preference for one activity and which activity they were more likely to repeat. For preference, children were just as likely to prefer the activity by hand as on the computer. This was true for the Important \((0.67 \text{ vs. } 0.33, p = 0.152)\), Design \((0.50 \text{ vs. } 0.50, p = 1.00)\), and Game conditions \((0.43 \text{ vs. } 0.57, p = 0.678)\). In terms of which activity children were more likely to repeat, children were just as likely to say they would repeat the drawing or game activity by hand as on the computer. This was true for the Important \((0.54 \text{ vs. } 0.46, p = 0.839)\), Design \((0.55 \text{ vs. } 0.45, p = 0.832)\), and Game conditions \((0.43 \text{ vs. } 0.57, p = 0.678)\).

Persistence

A mixed design ANOVA with condition \((3)\) as the between subjects factor and activity \((2)\) as the repeated measures was performed on time spent on the activity. There was an effect of condition \([F = (2, 56) = 3.567, p = 0.035, n^2_p = 0.113]\). Bonferroni post hoc tests revealed that children in the Important condition spent more time on the task than children in the Design \((p = 0.013)\) condition. There was no difference in time spent on the Important vs. Card game conditions \((p = 0.158)\) or Design vs. Card Game conditions \((p = 1.0)\). There was no effect of activity \([F = (1, 56) = .107, \text{MSE} = 99508.419, p = 0.745, n^2_p = 0.002]\), and no interaction between condition and activity, \([F = (2, 56) = 2.514, p = 0.090, n^2_p = 0.082]\).
computer (18%). In contrast to the Important drawing, there was no difference in the percentage of children who preferred to hang the design drawing made by hand over the design drawing made on the computer, 0.60 vs. 0.40, \( p = 0.503 \).

Discussion

Electronic media are ubiquitous: they surround both children and adults. From an early age, children are exposed to television, computers, video games, and cell phones. Children are texting, e-mailing, chatting on the internet, and joining social networks. Children are spending more and more time on the computer and this includes creating digital art. The blank sheet of paper has replaced by a computer screen; color pencils by a computerized drawing tablet.

Many studies have examined whether the digital world is harmful or beneficial for children’s development. On the positive side, it has been shown that video games can improve spatial skills in children (Subrahmanyam & Greenfield, 1996) and more time spent on the computer is associated with higher academic performance independent of children’s socio-economic status (Fish et al., 2008; Rocheleau, 1995). However, disturbing trends have also been noted (Gardner & Davis, 2013; Turkle, 2011). Gardner and Davis found that children often become “app dependent.” And Turkle observed that children now prefer robotic to live pets. She also reported that children today do not value authenticity; they prefer relationships to robots over relationships to people.

The digitalization of writing has some objective negative consequences. Five-year-olds asked to reproduce a letter by copying it showed greater neural activation in areas associated with reading and writing than children who typed the letter on a computer. (James & Engelhardt, 2012). And when elementary school children were asked to compose words by hand or on the computer, those who wrote by hand did so with greater accuracy and more creativity than those who composed the words on the computer. (Berninger et al., 2006).

Little research has examined the subjective experience, for children, of engaging in activities digitally that were performed by hand a generation earlier. The goal of this study was to determine how the experience of drawing on paper using hand held colored pencils differs for children from the experience of creating a drawing by pointing and clicking and watching the drawing emerge on screen. Specifically, we asked about the effects of both drawing activities on mood, persistence, enjoyment, and perceived competence. We also examined which activity children prefer and value more. We included a control, non-art activity (the card game of Solitaire) so that we could determine whether any preference for working by hand rather than digitally holds for a non-art activity as well.

Contrary to our hypothesis we found that mood improvement did not vary as a function of activity. This may have occurred because all three conditions (important, design, and card game) regardless of activity were distracting. Previous research has shown that using drawing as a form of distraction is more beneficial for improving short-term mood than using drawing as a form of venting (DePetrillo & Winner, 2005; Dalebroux et al, 2008; Drake & Winner, 2012; Drake & Winner, 2013; Pizarro, 2008). It has been theorized that distraction tasks improve mood because they are cognitively demanding and shift our attention away from mood congruent processing (van Dillen & Koole, 2007). Mood improvement may not have varied across the three conditions and between activities because the tasks were cognitively demanding and thus shifted the child’s attention away from the negative content of the film clip and the recall of their sad memory.

When asked which activity they would like to repeat, children did not demonstrate a preference. But which activity did children enjoy more? Consistent with our hypothesis, we found that children enjoyed making art by hand more when drawing something personally important. They enjoyed making art on the computer more when drawing a design. It seems plausible to suggest that drawing by hand allows children to express themselves more freely (consistent with Berninger et al., 2006), while the computer program is more constrained, but is particularly good for special effects, and hence for designs. We found no difference in enjoyment for the Card Game condition for hand vs. computer, thus making it all the more striking that when drawing something of personal importance, the old fashioned way is preferred.

We also investigated which activity children felt more competent doing. Consistent with our hypothesis, children felt more competent making a drawing by hand than on the computer -- but only when making a drawing of personal importance. There was no difference in perceived competence between the two activities for the design or card game conditions.

Consistent with our hypothesis we also found that children valued the drawing product more when made by hand than on the computer. Even though previous research suggests that children often prefer technology over human interaction (Turkle, 2011), we show that this is not always true. When it comes to art making, children value creating personally important images by hand more than on the computer.

Why might this be so? It is possible that children view the handmade product as more authentic: a drawing by hand cannot easily be reproduced while a drawing on the computer can be printed many times. Such an explanation would be consistent with research by Bloom and colleagues that demonstrates that children value original objects over duplicates (Hood & Bloom, 2008). It also quite possible that the tactile experience of working with art supplies lends the final product more value. Finally, children may be sensitive to the effects of positive contagion. Just as adults prefer objects touched by celebrities or famous artists (Argo, Dahl, & Morales, 2006; 2008; Newman & Bloom, 2011) children may prefer the drawing with which they had a tactile experience. While the majority of children described their handmade drawing as looking better (80%), a subset did describe the handmade drawing as “unique” or “special.” Future research should disentangle whether the greater value
of handmade drawings (when drawing something of personal importance) is due to physical touch or the one-of-a-kind nature of the drawing.

Taken together, this research suggests that creating art by hand has psychological benefits for children. Even though we live in a digital world, there is something special about creating art work by hand that cannot be gained from creating art on the computer. When making images of personal importance, children value the experience more, and value the final product more, when these images are made directly on paper than digitally. These effects cannot be explained by any differences in mood improvement between the activities. Despite the undeniable fact that in today’s culture, digital media are everywhere, when it comes to creating art of personal importance, children turn back to hand held pencils and paper.

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References
Technological Decline of the Art

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Abstract

Result of the modern global technological democratization is the triumph of civilization, which leads to redundancy and exhaustion of the art. Analysis of the most important processes, currents of contemporary artistic culture allows to detect some sort of evolutionary algorithm, which characterizes the present stage as massive reproduction-replication. Redundancy of culture, the exhaustion of art, the triumph of civilization are a direct consequence of universal technological progress. Juvenilism of contemporary culture, simplification against the background of amazing scientific and technological progress are organic features of the evolutionary process. The hypothesis does not predict End of the world. Innate cognitive need as a guiding line in the objectives, closed on man and his supernaturals mission, is actively seeking new forms of implementation.

Keywords: artist, technology, civilization, evolution, neoteny, democratization, duplication, reproducibility, algorithm, juvenilism, globalism, redundancy.

Evolutionary changes of art and an artist characterize not only the trends of the artistic life, but also they characterize the culture as a whole from the religious philosophy to an economics. Today, as always, the transformation in the field of art demonstrate important trends era. Kant detects the highest degree of creativity (genius) not in scientists, who open preset laws of the Universe, he detects it in people of art. Therefore it has complete sense to very close look at the field of art. Transformations of the main hero on this stage -- of an artist in the democratic world, probably, are connected with the most important trends of our time.

“Artistic” Fruits of Progress

Contemporary artistic culture and an art are changing rapidly and amazingly. The influence of art has grown immeasurably. An art became the property of billions. Today an actor can become by the President of a superpower. However, this does not give grounds to see the triumph of art. Advertising-marketing cult of the democratic pop stars is principally not similar to the worship of the unique creative personality.

Walter Benjamin in the known work (Benjamin, 1982) links the crisis of artistic culture with scientific and technical progress. He finds the fundamental importance of technical reproducibility of the art works. Reproducibility washes away the aura of a masterpieces and dissolves first sacred and then ritual grounds of the art works.

Benjamin connects the possibility of an adequate response to the transformation of reality under the influence equipment with a cinematograph. Benjamin sees the important specifics of cinema (the most important art of the epoch): "Technical reproducibility of cinematographic works directly rooted in technique of their production" (Benjamin, 1982). He noted that the orientation of the reality on the masses and masses on reality - the process, which influence on the thinking and perception is infinitely. Benjamin confirms the evolutionally progressive character of this process.

Aldous Huxley, author of the famous utopia "Brave new world" (Huxley,1995) stays on the polar position. Huxley observes a sharp disparity of cultural level and advanced accelerated growth "printed and artistic production". He is convinced that the inevitable decline in the quality of this production is a sign of obvious cultural degradation (Huxley,1935).

To weigh the arguments Huxley, let us look at the situation in the scientific sphere, where it is possible a quantitative comparison. Simple arithmetic leads to the conclusion that the average efficiency of the "scientist" falls in the twentieth century in very many, many times. The analysis of popular culture, the study of modern social and cultural dynamics and general observations (for example, the trend toward a lower level of education) give grounds to disseminate these estimations on the humanitarian sphere.

Conclusion Huxley about the stable increase of production low sort of art-products corresponds with the overall democratic trend. There are no reasons to change this drift. It is possible to link these seemingly incompatible and convincing positions (of Benjamin and of Huxley) with a global course of artistic culture of the past century.

Global Evolutionary Algorithm

A leap toward a global world can be seen as an intrusion into the culture of multimillion uncultured masses. A culture develops through conservation of experience and transmit it to future generations. Reliability of information transmission falls in mass culture. How can culture provide the translation efficiency in such conditions?

A leap toward a global world can be seen as the uncultured masses expansion in the culture. This expansion is determined by the increasing of demographic pressure and by the widening of cultural space. A culture develops through conservation of experience and transmit it to future generations. How is it possible to ensure a effectiveness of the broadcasting of experience when the reliability of transmission is very low?

In such situation the effective evolutionary method of preserving and enhancing of the experience is a multiple replication and duplication of information on a growing
number of media of information. Just such technology is become an effective instrument of the democratic cultural revolution. Now actual support of evolutionary acceleration is solved by mass reproduction-replication in all directions. We will try to confirm the hypothesis of such global evolutionary algorithm by means analysis of the events on different fronts of contemporary artistic culture.

The first direction of intensive reproduction -- a technical reproducibility of the art works.

Even in such traditional effective industry as publishing the modern computer printing technologies allow to considerably increase the circulation of paper publications, a variety of genres of printed products (also the wealth of electronic books and texts which are available today for practically all and always).

Up to the XIX century the total time listening to music have taken in the life of a common man tiny fraction of a percent. The appearance of sound recording and sound reproduction has led to such a powerful replication of the sound matter that our century can be called the century of music. The Photography has opened unprecedented opportunities for visual reconstruction of the world, that was for millennia extremely time-taking process. Digital recording and playback of images, of spatial structures have decisively solved the problem of reproducing the fine art and of renascence of visual objects.

The second - art of the mass audience

The dynamics of culture, the need for expanding the experience and knowledge give rise to new methods -- new kinds of art. A technical progress creates the basis for such a breakthrough and discovers the previously unknown information media (Drikker, 2000). The most important feature of these new kinds of art is their initial orientation to the radical expansion of the audience. This is, first of all, the movie. Next the radio appeared, then television which, beginning as a means of broadcast, soon causes a whole series of television genres.

Cinema, TV, PC, mobile device generate a special direction -- a screen art. Such modification of art opens up unprecedented opportunities to reach a vast audience.

The third – duplication of the artist.

The inquiry of billionth army of art consumers and of entertaining produce is rapidly increasing in the course of demographic and democratic Bang. This request causes the development of "productive forces" through the mobilization of fighters for the artistic front and rear. Mobilization is realized in frame of a General program of flow production of "creative workers" (of writers, musicians, artists, actors...) in public, private, formal, amateur universities, institutes, colleges, courses.

The campaign results are impressive. For example, printed materials, living today millions of "writers" (volume, number of printed characters), exceeds all what created by humanity during the preceding centuries and Millenniums. The quantity of museums and Museum workers is increasing exponentially. Numerous Biennale, theatre and film festivals, competitions, number of laureates are multiplying from year to year. A constantly growing audience provokes the emergence of a whole class of commentators, theorists, curators.

The General line is enhanced by active invasion of technology in the creative process. Benjamin considered that a birth photography was by fatal moment for the artist and art. Now everybody could receive high-quality image without connection with art abilities. However it is impossible to compare the wonders of those times with possibilities that offers a package of standard Microsoft software and digital camera for millions of ordinary users who want to play role, for example, of photographer...

The fourth – a repetition as the main creative method.

Information support (service of rear) continuously increases a power and provides an advertising, sponsorship base. It already plays a crucial role, defines already many tens years a strategy, policy, technology of modern art. In the conditions of hypermass audience and of market attitudes the democratic ideology introduces a repetition as the most reliable way of cultural communication.

Now a success, fame of artist is hard connected with confidently recognizable brand, which encourages authors to remain a loyalty to successfully found method for all creative way (which was very short way for Modigliani, or very long way for Chagall). Such phenomenon as the remake for cinema (very strange for organically dynamic art) is becoming one of the popular genres. TV serial from hundreds series or rock bands, which poorly distinguish from each other, have a record audience.

The fifth - new genres.

Humane democratic culture gives a start for moving the primitive art from the periphery to the fore. The number of grandparents, who are trying themselves in the field of fine arts, is growing so rapidly that this creative work are allocated in a separate direction.

Today the children's creativity is also not less fashionable. Now exhibitions are demonstrated not only in the family circle, in a kindergarten or school. Large specialized centers, the great art museums are actively engaged for exhibitions of children's art at the international level.

It is interestingly to understand whether there are any reasons which join seemingly very different, but equally successful directions: from abstract art to children's drawing?

A predisposition of a genre for mass reproduction (by direct replication, by replication performers, by conditions for replication...) is the main critical condition for its success in the democratic era. Compositions of naive primitive or abstract paintings have minimum connection with heights of technical skill and with competence. They are widely accessible in all respects and do not require professional training, long and heavy training.

The same principles are in the basis of film and television series (here activity of director or actor are maximum simplified, the imagination of an audience or of author is not required); in the basis of the photography art, where the selection is actually impossible in the conditions of an
The automated production of millions of images in every hour. Such extreme accessibility of reproduction and perception determines the genres which are noted by the maximum popularity, by the most powerful response of planetary audiences.

**Technologic Democratic Challenge**

However why did the obvious simplification appear after many centuries of the humanism ideals, after the Enlightenment and Christianity? Probably, the crisis of contemporary art and of modern culture tells about their some exhaustion. The dominant rational culture has lost the drive and has come into technological phase. The culture has moved to the stage of automation not only of production, but also of perception. To understand these results, let us think about their origins.

Let us remember about the problem which have existed for a long time – about the opposition of the art of classical and avant-garde, about endless debate: what is art, is it possible to define its borders? Recently, the intensity of the debate is obviously weakened. Tolerant view dominates today: Giotto and Malevich, Filippo Lippi and Mondrian, Rembrandt, Savrasov, Warhol and performances of Abramovich create continuous line of the art development, which grow up from one root. This approach is very promising.

First, it shows how the absolute majority is fully and equally indifferent to the new art and to old art too. It is not about who is "better"? However, the conventional opinion that Botticelli and Malevich have similar goal can be explained only indifference.

Further, it is pointless to argue about tastes: Van Eyck, Ingres, Pissarro, Kandinsky, Warhol, Bacon - someone like that. But let us try to move to an integrated assessment of twentieth-century art and of any prior stage. C. Dali had not doubts, that alone Velazquez greatly outweigh of surrealism, all of Dada, and futurists together. Malevich and Marinetti had appreciated their own work much more significant. However it is difficult to balance the impression (net "weight") from the art of the Renaissance and integral common weight of cubism, of abstract art, of Suprematism.

Is it possible, again integrally, to compare the music of the XX century (Prokofiev, Gershwin, Armstrong, Stravinsky...), its melodic, harmonic, composite wealth and power, emotional complexity and filled with the music of the XIX century (Beethoven, Verdi, Wagner, Schubert...)?

What about literature? Unlike other types a classical tradition has not revolutionary broken for a literature. A list of the greatest talents of modernity (Joyce, Faulkner, Nabokov, Trifonov...) is very impressive, but once again - until you did not write another line: from Byron to Lev Tolstoy... You must agree, it is impossible to call this line as ascending line.

In that case, what is this line?

Therefore, in the second, let me suggest – the art dies out (like dinosaurs) during last hundred years. Not immediately, dinosaurs were disappearing over millions of years and artists too. Subtypes, mutants are met. However in "nature", in natural - cultural environment an art is evidently dying.

If we are return to the phenomenon of art vanguard, the amazing metamorphosis are shocking. "About painting in Suprematism can not be a speech. Painting has long outlived, and himself artist is the prejudice of the past", -- Malevich declared (Malevich, without the year). Futurism, Dadaism are basically rigidly antibourgeois, they are filled by contempt to vulgarity, to imitation. Their installation is focused to "the merciless annihilation of the aura of creation", of optical illusions, to the denial of aesthetic value.

What after hundred years? The today Establishment, numerous Biennale and festivals insist on more subtle, complex, “esoteric” aesthetics. Actual art with children's naivety multiplies picturesque and constructive masterpieces and persistently expands its representation in classic and new museums.

A life have not kept, alas, - nothing from the bright, bold ideas of "art outside art", from "the great futuristic laughter".

In accordance with the General long-standing trend a real practice has turned the contemporary art in a rut effective replication.

But maybe is this the problem of the "old" art, which has not got control over modern technical potential? It looks not like. Not by chance, there was in during the long 20th century only one fundamental new kind of art - cinema. However, specialists have noted a crisis situation in the fate of cinema too: "Cinematic theater repeats the history of painting and of other classical arts in the beginning of the century when Futurism and Dada had appeared (Virilio, 2004)."

Sensitive leader of the avant-garde -- Marcel Duchamp already in the early 20-ies had understood that his "the art of protest" had enthusiastically taken of fat audience. In 1923 he announced about completion of artistic activity. In a next decades J. Cocteau declared: "I am leaving the profession of director as the technical progress made it by available to all". Army, millions with a digital apparatus quite successfully assimilate by utterly simplified technique of a creative search. Moreover, in the production of the film a man with a movie camera becomes a superfluous figure: "Camera obeys the computer and the computer opens for new abilities. Machine can analyze environment and automatically interpret events (Virilio, 2004)".

The scale of current processes in the artistic culture implies a deeper meaning, and serious consequences.

**Art as an Indicator**

The newest era is very peculiar. On the one hand, the man landed on the moon, decrypts the genome, he makes a successful steps towards the creation of artificial intelligence. On the other hand, media of wisdom - old men - are pumped by botox, stem cells to return the silly youth; billions of representatives of free humanity are busy by computer and TV games; youth lifestyle and youth fashion reigns in all layers, everywhere. Children's tastes (comics, fantasy, horror) define the main stream in art. A post-industrial society rapidly moves in full juvenilism.
To explain this mysterious drift of culture, let us recall about neoteny. Neoteny is the most important evolutionary characteristic of hominids. The ability to save some embryonic quality in adulthood has allowed man, for example, to obtain again the color vision. Today's cultural neoteny (the obvious domination of the child psychology, in the best case adolescent psychology) can be seen as a symptom of the degenerate degradation. However infant plasticity is removing the barriers for radical mutations and is preparing a new breakthrough.

The modern rational culture in its intellectual effort (with the help of civilization technologies) has achieved quite a lot in the correction of behavioral instincts. But culture is only keeping in natural impulses, it can not control instincts. A technological progress is powerless to authority of instinct. An insurmountable obstacles are the conservative consciousness, its basic set of primitive, atavistic attitudes, a narrowness of his dichotomous perception and evaluation. Only overcoming the mental barrier does by possible to exempt a truly human cognitive ability from the domination of instincts (which are served by intellect).

How is it possible to win the mighty primeval call of subconscious, if vital potential of subconscious is obviously much higher than any rational intellectual structure? The way to overcome the potential barrier is to use a powerful emotional charge to break into the Kingdom of instinct. Artistic, religious geniuses demonstrate such creative charge. They find energy thanks to insuperable passion for knowledge and beauty.

Perhaps the power of psychic induction (the ground for it prepares a cultural neoteny) will change the animal nature of man, will make a wealth of culture as accessible to man as articulate speech.

What about hypothesis of the decline of art as an Autonomous culture (and therefore about the degeneration of the artist)? May be does it predict Doomsday? No, it does not predict absolutely. We can see a completely different meaning in the disappearance of the artist - Oracle, the Creator, who thrust one's vision of the World on people. Creative energy (in process of mass distribution and reproduction of more and more reductive, specialized "Creators") escape from a narrow professional field and will be able to pass in the living activity (responding to the motto Marinetti, who called the artist to transcend, to go beyond art.

No, it's not a question about the End of the world, but a culture should find the answer for challenges which is very serious, since these challenges refer to essence of culture.

In light of the urgent radical changes, it is reasonably maybe to listen to Umberto Eco, who believes that modern man overestimates the art. May be it can assume that the existence of the art (as a social phenomenon rational culture), has the time boundaries. These boundaries will also mark the end of an era of the prophets - artists.

However innate cognitive need and aesthetic ability (as a guiding line of motion included "in the hierarchy of goals which concentrate on the man and on his supernatural destiny" (Eco, 2003)) are actively seeking new forms of creative implementation.

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Major Ways Visitors of the General Public Type Use their Imagination in a Fine Arts Museum. Results and Meaning

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Abstract

In a fine arts permanent exhibition, it has been observed that the imaginative functioning of visitors of the general public type accompanies one third of what they think or feel. This functioning is expressed through three types of strategies: escaping, integration and reintegration, integration being the most frequently used. Unfortunately, the end result of these strategies leaves visitors unsatisfied. Most of the time, their disappointment is due to the paucity of the information offered by the exhibition.

Keywords: visitors; museum; imaginative functioning; strategies.

Very few museum publications can be found on the use of the imaginative functioning by museum visitors. Since 1973, only a few paragraphs or short papers dealing with the topic seem to have appeared (Gilles & Wilson, 1982; Sobol, 1980; Vikan, 2010). Meanwhile, philosophers, psychologists or ethnographers were producing numerous texts on imagination (see in particular syntheses by Green, 1998; Kearney, 1994; Markman et al., 2012). Two reasons could explain this situation: the manner in which imagination is understood in the museum milieu, and the instruments used to study it.

According to Bedford (2004), who seems to express what museum professionals are thinking, the use of imagination while strolling through an exhibition should benefit visitors with many rewards: inventions, discoveries, important personal improvements, and even profound social involvements. It is rather easy to show how unrealistic this understanding of imagination could be. For, during his walk through an exhibition, the best that can happen to a visitor is to get an idea or an intuition that later could produce one of the preceding benefits. Indeed, the visitor does not carry with him any tool or material that he may use to give materiality to his ideas. As for personal transformations, we know since Freud’s works that we are dealing with the results of a long and complex process. Ultimately, a social engagement implies interventions frequently repeated and modified that spread over years; consulting a few biographies suffices to convince oneself.

The instruments used in museology to gather information on visitors are usually: “Tracking the visitor”, i.e. observing him without his knowing, questionnaires, or interviews. Unfortunately, these instruments are not efficient to obtain valid information on the visitor’s imaginative production. It is evident that “Tracking” cannot reveal what is happening in the visitor’s head! As for a questionnaire or an interview, they only can be used at the very end of the visit. So they command something that the visitor cannot produce: recalling all what he has thought during his visit, and reporting it exactly.

So if one wants to study the imaginative functioning of a visitor while he is strolling through an exhibition, one should at least find a new way to access to it while it is happening, and utilize a definition of imagination that fits the way it appears in this context.

Realizing the Present Research

The present research includes the following:

1. Developing a means to access the imaginative functioning as it is working;

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23 This date marks the publication by UNESCO of a short document entitled « Musée, imagination, éducation ». Before this date, the museum milieu seems to have published only one title (Beneker, 1958).

24 An asterisk means that references are too numerous to be all cited.

25 This research has been founded by the Social Sciences and Humanities Research Council of Canada, the Fonds pour la formation de chercheurs et l’aide à la recherche de the Province of Quebec, and has received logistical support from the Université de Montréal.
2. Identifying the forms that it takes in the exhibition room;
3. Developing a sample and finding a museum where to gather data;
4. Determining the results:
   a. The importance of the imaginative functioning in the exhibition room;
   b. The strategies employed by the visitors when they use their imagination.

Developing a Means to Access the Imaginative Functioning While it is at Work

An adaptation to the museum context of the “Thinking Aloud” technique elaborated by Ericsson and Simon (1984, 1993) seemed the most appropriate means because it permits to obtain good-quality data on various cognitive processes. The adaptation realize consists in asking a visitor as he enters the museum to go around the exhibition as he wishes, saying out loud what he thinks, imagines or feels, without trying to remember or justify it. His task is merely to voice his experience as he goes along. What he says is recorded on tape and constitutes what we called a “discourse”. Once the visit is over, the content of the discourse is entered into a computer for analysis (Dufresne-Tassé et al., 1998 a, b).

Identifying the Forms Taken by the Imaginative Functioning

Analysis of discourses obtained by the “Thinking Aloud” technique allowed us to identify two forms of the imaginative functioning already distinguished by Kant and Sartre, i.e. the reproductive and the constructive.

In the reproductive form, the visitor evokes what is absent to mentally examine it; usually personal experiences, image-like knowledge, or events happening outside the room presently visited.

In the constructive form, the visitor elaborates what is not, or not yet existing. This elaboration could take many shapes, such as hypothesis production, suggestions, development of a device, or even transforming a painting into a three-dimensional landscape and entering into it!

Developing a Sample and Finding a Museum to Gather Data

Sample We worked with a stratified sample of 90 adult visitors: men and women from three age groups (21-35, 36-50, 51-70 years of age), three levels of education (less than a B.A., a B.A., and more than a B.A.), and visiting habits ranging from first time ever to twice a year. They were in fact occasional visitors, or what is called “general public type” visitors.

Museum Data were collected at the Montreal Museum of Fine Arts in the permanent exhibition of the Canadian Art collection. This exhibition showed mainly paintings of the 19th century and first half of the 20th century, but also some sculptures of the same period. These objects were presented with a minimum of information. At the entrance of the exhibition, there was a small panel indicating “Canadian Art”, then each object was accompanied by a label giving its title, the date of its production, the artist’s name, dates of birth and death.

Results

Importance of the Imaginative Functioning in the Exhibition Room

We noticed the visitors’ use of their imagination in 30.2% of all what they had said while strolling in the exhibition rooms. Important variations were also observed from one visitor to the other, some using it more than 500 times, others limiting themselves to about 20. Moreover, when we shortly talked with them just before their leaving the museum, the visitors who had used their imagination at a high level were saying that their visit had been very enjoyable. They were also talking enthusiastically of the objects that had interested them most and were exploring new aspects of them. On the contrary, those who had used their imagination on a low level kept saying: “A museum is a death place”, “A museum, it’s frozen”, “A museum is a boring place”.

So the imaginative functioning seems to be an important component of the visit to a permanent exhibition of fine art objects. However, the use of this functioning shows a wide range of variation among visitors of the general public type we have been working with, and induces visits perceived in very different manners.

Strategies Employed by the Visitors While They Are Using Their Imaginative Functioning

While reading the visitors’ discourses, we quickly discovered that they were operating their imaginative functioning in different ways that we called “strategies” because they were structured, and could be found in great numbers. We shall describe these, indicate their numerical importance, and pay attention to how unsatisfied visitors were with some of them.
Description of the strategies

We observed that the imaginative functioning takes its bearing habitually on what the visitor is observing, and sometimes on what he is reading. Then the relationship of the imaginative production with the object can go on according to three ways that determine the same number of strategies. These strategies are the following.

Escaping

Starting from its rest point, the imaginative functioning runs freely and the visitor no longer minds about the object that he has begun treating; so he ends up forgetting it entirely.

Integration

The rest point marks the beginning of short interventions of the imaginative functioning, followed by a return to the object at stake and its observation. So there is a continual coming and going between observation and imaginative production. This movement ends up with the construction and enlargement of the object meaning.

Reintegration

The imaginative functioning catches one aspect of the object observed and explores it for some time. When this is over, the content of the exploration is included in the treatment of the object.

Numerical importance of the strategies

Due to the immense work necessary to identify the strategies in the lengthy visitors’ discourses, we drew a sub-sample of 30, consisting of the 15 visitors who had made most use of their imaginative functioning, and the 15 who had used it the least. This type of sample seemed preferable to a random one because it provided us with a fair number of strategies produced by two groups of visitors who, evidently, functioned differently. So the following results will be based on the sub-sample of 30. But unfortunately, due to the restricted space offered here, we will present the data only globally, without differentiating the results obtained on the two groups of visitors.

Table 1: Data on strategies produced by 30 visitors

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<thead>
<tr>
<th>Description</th>
<th>Number</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Total number of strategies produced</td>
<td>890</td>
<td></td>
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<tr>
<td>Mean number of strategies per visitor</td>
<td>29.67</td>
<td></td>
</tr>
<tr>
<td>Number and percentage of escapings</td>
<td>63</td>
<td>7.08%</td>
</tr>
<tr>
<td>Number and percentage of integrations</td>
<td>749</td>
<td>84.16%</td>
</tr>
<tr>
<td>Number and percentage of reintegrations</td>
<td>78</td>
<td>8.76%</td>
</tr>
<tr>
<td>Number and percentages of unsatisfactory integrations and reintegrations</td>
<td>277</td>
<td>33.49%</td>
</tr>
</tbody>
</table>

As could be seen on Table 1, the 30 visitors developed strategies 890 times during their strolling in exhibitions rooms offering paintings and sculptures. The mean per person is 29.67. Integration, that represents 84.16% of all he strategies produced, is by far the most frequent one. The two other strategies, reintegration and escaping, are much less used (respectively 8.76% and 7.08%). But with integration and reintegration, many times (33.49% of he cases) the visitor ends up unsatisfied of what his imagination has produced.

Discussion

Firstly, the data presented in Table 1 allow us to complete the first results presented above. Indeed, the imaginative functioning, that occurs in 30.2% of the discourses content, manifests itself through the use of strategies, i.e. through structured interventions, occurring in great number, of three different types, each of them happening with its own frequency.

Secondly, results of Table 1 offer an opportunity to deal with the frequency of each of the three strategies used by the visitors. As for integration, that supposes insertion of short imagination interventions while the object treatment progresses, its very high frequency could be explained in the following way. On the one hand, the visitors we worked with knew little about the objects they were looking at, and having visited museums rarely before, they had not developed skills in the treatment of fine art objects. On the other hand, the exhibit itself did not offer much information to facilitate the treatment of the said objects. So the risks of being wrong and attributing a false meaning to the objects was one of the visitors greatest fears. Whence the briefness of their imaginative functioning interventions, their constant return to the object and the security provided by its observation, but also the meagre benefits that this entailed.

Regarding reinterpretation, which consists in including in the object treatment a long intervention of the imaginative functioning, its low frequency could be explained by the high level of risk that it implies. Indeed the visitor who has a poor knowledge of the objects and do not feel skillful in their treatment accepts to draw much from his personal world before going back and confront it to the physical characteristics of the object. In such a situation, the risk is not only to be mistaken, but also to loose one’s time!

We were not expecting to see the visitors implicitly or explicitly trying to check if their imaginative production was relevant, and to manifest dissatisfaction in respect of a huge proportion of their integrations and reintegrations. So we studied the sources of their frustration, and identified the following ones: 1) the relevance of their imaginative production could not be established; 2) their production brought about questions that could not be answered; or 3) a problem that could not be solved. The same study showed that in 90% of the cases, such difficulties emerged from a lack of information coming from the museum. These last observations induced us to think that visitors of the general public type have a strong need for scientific information, which means a profound desire to know and be rigorous with the information they manipulate. So when the museum leaves them in doubt, it deprives them of an important part of
the pleasure they could get in observing objects and giving them meaning.

Regarding the escaping strategy, we can explain its low occurrence among the general public visitors because it supposes a simple giving up of the museum object, when they come expressly to the museum to look at them (Dufresne-Tassé, 2008). Nevertheless, this kind of visitors is strongly attracted by the escaping strategy because he finds great pleasure in going into his own world of experiences or knowledge, and to explore it. This is even one side of the visit that he enjoys the most (Dufresne-Tassé, C. and al., 2006).

**Perspectives**

We have seen that the visitors of the general public type have strong epistemological requirements and that they are ready to enlarge the meaning of the objects that they are observing with what comes from their personal world of experiences and knowledge, on the condition that the museum provides them with some information that marks out the exploration of this world. A research now in progress (Dufresne-Tassé, 2013) shows that the information that best answers the visitors needs is not some pin point details about each object, but some contextual information that gives general meaning to a set of objects.

**References**


Reliability of Quantitative Content Analyses

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Abstract
Reliable coding of stimuli is a daunting task that often yields unsatisfactory results. This paper discusses a case study in which tropes (e.g., metaphors, puns) in TV commercials were analyzed as well the extent and location of verbal and visual anchoring (i.e., explanation) of these tropes. After a first coding round, low interrater agreement scores were found. Examples are presented which demonstrate the reliability issues. The paper concludes with an overview of options to deal with reliability problems as described here. Low interrater agreement scores may reflect the richness of the data and their inherent ambiguity and need not necessarily be disapproved of.

Keywords: content analysis; reliability; tropes; anchoring; advertising.

Introduction
Investigating the aesthetic preference for one stimulus over the other starts off with reliably determining to which category each stimulus belongs. Is an image in an advertisement an example of a good or a bad Gestalt? (Where does ‘good’ end and ‘bad’ start?) Is a trope (i.e., a puzzle-like rhetorical figure, e.g., a metaphor or a pun) in a TV commercial explained (and to what extent) and can this explanation be found before, during or after the trope is presented? Reliable coding of rich stimuli is a complicated task with often unsatisfactory results.

To illustrate this issue, this paper discusses a quantitative content analysis in which tropes in TV commercials were studied as well the extent and location of verbal and visual anchoring (i.e., explanation) of these tropes. Examples will be presented which will demonstrate the reliability issues. The way in which these issues were dealt with will be reported. The paper concludes with an overview of options to deal with reliability problems as described here. Other statistics are considered as well as other approaches.

Theoretical Framework
An often-used means to determine the reliability in quantitative-content analyses is intercoder agreement (Neuendorf, 2002). For instance, two coders are trained to become sufficiently acquainted with the concepts and categories, helped by an extensive codebook. Then, they independently categorize all stimuli, and the intercoder agreement is calculated. Cohen’s Kappa is a well-known means to do so; this statistic corrects for chance agreement, as opposed to percent agreement. A Cohen’s Kappa of at least .80 is often acknowledged as sufficient agreement between coders (e.g., Aristein & Poesio, 2008), and .70 is regarded as acceptable for exploratory research (Lombard, Snyder-Duch & Bracken, 2002). However, such high scores have proven hard to achieve when analyzing rich data. Again and again, Cohen’s Kappa’s remain too low after one round of independent coding, despite extensive training, well-considered operationalizations, the use of simple categories and clear criteria, expert coders, etc. Low kappa’s seem to be a ‘fact of life’ (see, e.g., Spooren & Degand, 2010; Van Enschot, Beckers & Van Mulken, 2010). Spooren and Degand (2010) claim that this is because of the inherent ambiguity of the data in this field of research (see also Potter & Levine-Donerstein (1999) who distinguish manifest and latent content). Surely, coding errors are a threat to reliability and it is important to show that the encodings do not depend solely on the idiosyncratic interpretation of one subjective coder. But when we interpret rich data, we regularly encounter stimuli that can be interpreted in several acceptable ways. One interpretation may not always be better than the other.

A Case Study: Anchored Tropes
To illustrate the reliability problems as described above, examples will be discussed from a quantitative content analysis of 200 TV commercials. This content analysis was part of a study focusing on the comprehensibility and appreciation of tropes that were verbally and/or visually anchored (Van Enschot & Hoeken, accepted). A trope is a stylistic device, which deviates from communicating straightforwardly in an aesthetically pleasing manner. It does so in a meaningful way by creating a riddle the receiver has to solve (e.g., McQuarrie & Mick, 1996). Anchoring can be seen as the solution of the riddle. Verbal anchoring was defined as an explanation of the trope in the verbal part of the commercial (cf. Phillips, 2000), visual anchoring as an explanation in the visual part: depiction of the product and/or its attribute (e.g., a desirable property of the product). At a first stage, it was determined to what extent the commercials contained verbal and/or visual anchoring of tropes. At a second stage, these results were combined with consumer response data regarding perceived comprehensibility and appreciation of these commercials. At the first stage, several encoding decisions were made in four steps: 1) What is the claim of the commercial? (open-ended question, e.g., ‘This new orange juice (product) is made from freshly picked oranges (attribute)’ or ‘This insurance company (product) protects you with a smart mortgage solution (attribute)’), 2) Is a trope present (yes-no)?, 3) When a trope is present: What is the extent of verbal and visual anchoring (no-incomplete-complete)?, and 4) Where can the anchoring information be
found (before/during versus after the trope)? All encodings were explained whenever necessary.

Two independent expert coders analyzed each commercial using a lengthy codebook, which explained all basic notions and the procedure meticulously. At a training stage, the coders analyzed 20 TV commercials before doing the actual content analysis. These 20 commercials had been randomly selected and were not included in the actual content analysis. All raters examined the commercials carefully before allocating a code.

After one round of independent encoding, the reliability scores were low with Cohen’s kappa’s varying from a minimum of .15 (for the extent of verbal anchoring) to a maximum of .50 (for the position of the verbal anchoring). (Disagreements about the commercial’s claim were resolved in discussion.)

To deal with these low kappa’s, the raters were independently presented with each other’s encodings as well as the reasoning for these encodings in a second round, to use the raters’ knowledge and experience better. They were asked whether they would maintain their initial encodings considering the other coder’s deliberations or whether they would like to alter it. This second round resulted in considerably higher agreements between the two pairs of coders, varying from .69 (extent of verbal anchoring) to .94 (for the extent of visual anchoring). The first author resolved any remaining disagreements.

As a final check of the resulting classifications, a fifth coder, who had not been involved in the previous rounds and who was unaware of the study’s research aims, was asked to indicate for a random selection of 100 commercials to what extent she considered the proposed claim as an adequate representation of the commercial’s claim and whether the selected encoding regarding the presence of a trope was acceptable or not. If a commercial contained a trope, she indicated whether she agreed with the encodings of the extent and location of verbal and visual anchoring. The fifth coder agreed with all interpretations and encodings of the pairs of raters.

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A commercial for Zwitsal rich baby oil was analyzed (see Figure 2). A man salves his baby with the oil after which the baby shows his suppleness by putting his feet next to his ears. The voice-over says: “To keep that skin so supple, Zwitsal now offers rich oil with avocado”. The encoders disagreed about the presence or absence of a trope, in this case a hyperbole, an exaggerated claim. Question was whether or not a baby is capable of showing this amount of suppleness. One coder thought it was possible and one didn’t. After a second round of encoding, it was agreed upon that it was to be interpreted hyperbolically, and thus as a trope. The shown suppleness needs to be somewhat downgraded by the interpreter to arrive at the actual suppleness. But the other option is justifiable as well. These kinds of discussion about claims either or not being exaggerated (hyperbolic) occurred more often and reflect the ambiguity of the data.
Another example comes from the analysis of a McDonald’s commercial (see Figure 3). The claim of this commercial was: “At McDonald’s, you get a Coca Cola glass for free”. A man and a woman are blowing bubbles and creating Coca Cola glasses out of these bubbles. The voice-over says: “Now and only at McDonald’s, six exclusive Coca Cola glasses. You get them for free with each Collector’s menu and Collector’s salad menu. Collect them all.” The coders agreed upon the presence of a trope (the rather magical transformation of bubbles to glasses) but disagreed upon whether or not this trope was verbally anchored. If the verbal part of the commercial communicated the claim of the commercial explicitly, this was classified as complete verbal anchoring. If the verbal part only hinted at the commercial’s claim, this was classified as incomplete verbal anchoring. Verbal anchoring is linked to the trope. A trope is verbally anchored if its solution is given, either or not partially. In most cases, the commercials’ claim can be found in the solution of the trope, i.e., in the verbal anchoring (if present). However, in some commercials, amongst which this one, the commercial’s claim does not equal the solution of the trope. These commercials are difficult to analyze. The text of the voice-over does not help us figure out why the bubbles are transformed into Coca Cola glasses. But as the voice-over did spell out the commercial’s claim, the final encoding was ‘complete verbal anchoring’, leading to an adjustment in the codebook and the encodings for which this was relevant. Further operationalization and testing of the instructions in the codebook with more than 20 commercials may have prevented these kinds of initial disagreement.

![Figure 3: Screenshots McDonald’s commercial](image)

A last example addresses visual anchoring. If both the product and the attribute were depicted, this was classified as complete visual anchoring; if either the product or the attribute was depicted, the commercial was classified as containing incomplete visual anchoring. A commercial for the Dutch insurance company Centraal Beheer Achmea (see Figure 4) shows the preparation of an alien invasion accompanied by ominous music. Alternately, we see an unaware man and a woman relaxing at a camping site. But the invasion fails utterly. The invasion troops turn out to be so small that they crash into the fly trap at the caravan; the man and woman remain unaware. The commercial’s claim was formulated as: ‘Centraal Beheer Achmea helps with real insurance problems”. The discussion in the encoding process was about whether or not the trope (i.e., a negative metaphorical comparison between the seeming problems heading towards the man and woman and the real insurance problems we face in real life) was visually anchored. One coder noted that nothing of the commercial’s claim was to be seen, whereas the other coder wrote down: “These people presumably have an insurance at Centraal Beheer” and chose for incomplete visual anchoring. This seems to be in line with the instructions in the codebook which state that we speak of visual anchoring if the product or a property or user of the product is shown. However, from the images alone, we cannot tell that these people have an insurance at Centraal Beheer. Showing this man and woman does not help us out in determining the commercial’s claim. This is why the encoding ended up as ‘no visual anchoring’. There is a thin line between who can and who cannot be qualified as an obvious user of a product, i.e., a visual anchor. A clear encoding error arises when we look at another remark of the second coder who regarded the depiction of the text “Just call Apeldoorn” on screen (Apeldoorn being the village of Centraal Beheer’s headquarters) as visual anchoring. Counting depiction of text as a visual anchor is not in accordance with the instructions in the codebook and the concept of visual anchoring and can therefore be qualified as an encoding error, which was corrected in the second round of encoding.

![Figure 4: Screenshots Centraal Beheer commercial](image)

**Conclusion and Discussion**

The case study in this paper has illustrated the kind of reliability problems that arise when analyzing rich data. Sometimes, as in the Centraal Beheer example, encoding errors explain the disagreement; these were removed further along in the encoding process. But mostly, disagreements were found in the inherent ambiguity of the data. One option was not always better than the other.

Extending the training phase using more commercials may solve some of these disagreements. Spooren and Degand (2010) speak of a “calibration phase of the codebook during which the variables to be coded can be completed or adapted to account for unforeseen phenomena” (p.251). Fine-tuning the codebook by testing more commercials may diminish the amount of unforeseen phenomena (as in the McDonald’s example). Elaborate conceptualization and operationalization yielding a step-by-step model with binary categories could lead to sufficient insight into the phenomenon under study and, with that, to reliable encodings of data related to this phenomenon. Steen and his Pragglejaz Group (e.g., Pragglejaz Group, 2007) plead for this elaborate way of encoding and show successful reliability results with regard to the identification of metaphorical language (i.e., their MIP-project: Metaphor Identification Procedure). However, this is a time-consuming task, and may not be feasible for every study and research object. An adjacent, maybe more
important question addresses the validity of this approach. When simplifying, do we keep encompassing all aspects of the rich data under study? It may be the case that simplification and operationalization yield an unfair exclusion of some cases. Oversimplification would lead to reliable but at the same time invalid results. This would be the case if, for example, we would have said that a trope is present when a metaphorical comparison is made between what is shown (e.g., an apple) and what is meant (New York). However, this would exclude all tropes such as hyperboles, wordplay, irony, and so on. We would probably be able to come up with more reliable results but we wouldn’t cover the whole phenomenon (i.e., tropes); validity would be low.

Cohen’s kappa was used as an agreement index in this content analysis. This is an often used technique for nominal variables, which accounts for chance agreement (as opposed to the index of percent agreement that is assumed to be too liberal). Variants of Cohen’s kappa are available, which are, e.g., applicable in situation with different types of disagreement (i.e., weighted kappa; Cohen, 1968) or in situations with more than two coders (Fleiss, 1971). A downfall of Cohen’s kappa is that it may be too conservative (e.g., Cicchetti & Feinstein, 1990). It is in any case important to find and report on the causes of the achieved kappa’s by focusing on the instances about which the coders disagree. Another attractive measure is Krippendorf’s alpha. It is more flexible than Cohen’s kappa, being applicable to nominal, interval and ratio data and suitable for analyses with more than two coders. Working with more than two coders is often recommended. As Artstein and Poesio (2008, p.590) put it: “We believe that increasing the number of annotators is the best strategy, because it reduces the chances of accidental personal biases”. As said, Cohen’s kappa and Krippendorf’s alpha can both be used with multiple coders. Krippendorf’s alpha is a complex index, however, with difficult calculations to be made (Lombard et al., 2002). More detailed overviews, with advantages and disadvantages of these and other indices, can be found at, e.g., Artstein and Poesio (2008), Cicchetti and Feinstein (1990) and Lombard et al. (2002).

Rounding up, are low kappa’s indeed a fact of life? We might say that they are. Higher kappa’s may be reached with an even more elaborate – but not too narrow - conceptualization, operationalization and simplification. This would lead to a larger territory of explored and labeled data. But there will always be a periphery with ambiguous stimuli. This periphery is just as interesting and reflects inherent differences in our intuitions and the richness of the data. Reliability deserves attention in research papers: transparency about encoding procedures, intercoder agreement scores and consideration of the cases about which disagreement exists. It is an issue that needs to be noted, not ignored. This paper makes a move in doing so.

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References


Visual Aesthetics in Advertising

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Abstract
According to the processing fluency theory (Reber et al., 2004), fluently processed stimuli are preferred to more challenging stimuli. This contradicts Giora et al.’s (2004) Optimal Innovation Hypothesis, that predicts a preference for more challenging, optimally innovative stimuli. Hekkert et al.’s dual process model would explain both theories: Familiar stimuli would be preferred after short exposure, whereas optimally innovative stimuli would be preferred after longer exposure. An experiment was done to examine the effect of exposure time (20ms vs. 1000ms) on the aesthetic response to either familiar or optimally innovative advertising images. The results showed a higher aesthetic response to optimally innovative images regardless of exposure time. This study therefore did not support Reber et al.’s fluency theory nor Hekkert et al.’s assumption that two opposing mechanisms are at work at different exposure times.

Keywords: visual aesthetics; fluency; innovation; advertising.

Introduction
In advertising, people often adopt an experiential processing strategy (Meyers-Levy & Malaviya, 1999), basing their judgments of an advertising utterance on the feelings evoked by processing this utterance (consistent with Schwarz & Clore’s (1983, 2003) feelings-as-information model). Previous research on rhetorical figures in advertising investigated to what extent people prefer cognitive challenges, such as resolving puzzles, or processing complex puns or metaphors to more simple rhetorical figures, such as rhyme. It turned out that the assumptions about people’s preference to puzzle in advertising are incorrect: People prefer the more simple variants instead (see, e.g., Van Enschot, Beckers & Van Mulken, 2010). These findings are in line with Reber’s fluency theory that assumes that the more fluently the perceiver can process an object, the more positive is his or her aesthetic response (Reber, Schwarz & Winkielman, 2004).

Reber’s fluency theory seems to be contradicted by the work of Giora et al. (2004). They introduce the concept of ‘optimal innovation’. An optimally innovative stimulus is a stimulus that evokes a salient (i.e., familiar, conventional) response together with a novel, conceptually different response. The Optimal Innovation Hypothesis assumes that optimally innovative stimuli (e.g., ‘a peace of paper’) are found more pleasant than stimuli with just salient meanings (e.g., ‘a piece of paper’) (which would be processed more fluently).

This paper reports on an experiment testing these contradictory theories. As images are omnipresent in advertising, the focus lies on the prominent pictures in magazine ads. Familiar images are compared with optimally innovative images. Two separate mechanisms may operate here: A fluency-based response to familiar images – at an early stage of processing - versus a more conscious and cognitively mediated response to optimally innovative images at a later stage (Hekkert, Snelders & Van Wieringen, 2003). Exposure time is varied to test this assumption (cf. Jakesch, Leder & Forster, 2013).

Theoretical Framework
Reber et al. (2014) adopt an interactionist perspective on beauty by seeing beauty as a pleasurable subjective experience based on and directed toward stimulus properties. Fluency of processing is key in their view: “The more fluently the perceiver can process an object, the more positive is his or her aesthetic response” (p.365). The reason why this response is assumed to be positive is because high fluency is associated with, e.g., “progress toward successful recognition of the stimulus, error-free processing, or the availability of appropriate knowledge structures to interpret the stimulus” (p.366). Several studies have confirmed the fluency theory (e.g., Winkielman & Cacioppo, 2001, Winkielman & Fazendeiro, 2003).

Fluency theory seems to be contradicted by Berlyne (e.g., 1957, 1960, 1971, 1974, see also Palmer, Schloss & Sammartino, 2013, Hekkert et al. (2003) and Giora et al. (2004). Berlyne distinguishes a group of stimulus features known as collative variables (such as complexity, novelty, ambiguity, uncertainty and conflict). A collative variable has arousal potential, the ability to influence the level of arousal and consequently the level of positive or negative affect. Berlyne suggests that affect follows an inverted U-curve, moving up from neutral to positive as arousal potential goes up, but shifting from positive to negative after arousal potential passes an optimal tipping point. Note that fluency theory would predict that the least complex, least ambiguous, etc. stimuli would be processed most fluently and would therefore be preferred most.

Silvia (2005) convincingly explains why Berlyne’s theory is outdated. Arousal can’t be held as a homogeneous construct, as low correlations are found between different arousal measures, such as blood pressure, heart rate and
electrodermal responses: "the psychobiological assumptions of Berlyne’s arousal model are known to be wrong" (p.345).

Although the concept of arousal may be something from the past, Berlyne’s idea that collative variables would yield either positive or negative affect is still supported. Hekkert et al. (2003) performed a study on the effect of the collative variable novelty versus the opposing variable typicality, which would yield fluent processing on the aesthetic preference for various product designs (e.g., teakettles, telephones). According to fluency theory, the typical product designs would be processed most fluently and preferred most. But Hekkert et al.’s experiments supported their so-called MAYA principle (Most Advanced Yet Acceptable), and showed that people prefer an optimal combination of typicality and novelty. Both positively affected aesthetic preference, but as they tend to be one another’s opposite, each suppressed the positive effect of the other.

Similar findings can be seen in Giora et al.’s (2004) study testing their Optimal Innovation Hypothesis. According to Giora et al., an optimally innovative stimulus is a stimulus that contains both a salient (i.e., familiar, conventional, prototypical) meaning and a novel, conceptually different meaning (e.g., ‘a peace of paper’). Optimally innovative stimuli create “a spin on the familiar” (p.116). Giora et al. find support for their hypothesis that optimally innovative stimuli are regarded as most pleasing, more than stimuli with just salient meanings (e.g., ‘a piece of paper’) or pure innovations (without salient meanings, e.g., ‘a pill of pepper’).

Therefore, we see a paradox between Reber et al.’s (2004) processing fluency theory and the work inspired by Berlyne (Hekkert et al., 2003, Giora et al., 2004), the former predicting an aesthetic preference for fluently processed (e.g., typical, familiar) stimuli and the latter predicting a preference for somewhat more challenging (atypical, optimally innovative) stimuli.

In their discussion section, Hekkert et al. (2003) propose a dual process model of aesthetic preference, in which two separate, opposing mechanisms operate: An automatic, tension-reducing mechanism which favors familiar, typical stimuli (a fluency based gut response, phrased differently) versus a more ‘controlled’ and cognitively mediated, tension-heightening mechanism, which seeks and prefers novel, atypical stimuli. Hekkert et al. suggest that the available processing time may affect the relative contribution of each mechanism. With little time available, the automatic mechanism would prevail and yield a preference for familiar, fluently processed stimuli over optimally innovative stimuli. With more time available, the cognitively mediated mechanism would become active and the optimally innovative stimuli would be preferred.

This dual process model is partially supported by a study of Jakesch et al. (2013) who examined the preference for ambiguous versus non-ambiguous artworks in combination with different exposure times. Surrealistic artworks were presented as opposed to non-ambiguous control artworks in which uncommonly placed objects had been removed or modified. According to fluency theory, non-ambiguous stimuli would be processed more easily and therefore liked more than ambiguous, more hard to process stimuli. The results showed that ambiguous artworks were liked more than non-ambiguous artworks at exposure times of 500ms and at 1000ms, whereas no difference occurred at 10ms and 100ms. This only partially supports Hekkert et al.’s dual process model and it does not support fluency theory, as non-ambiguous stimuli were not liked more with shorter exposure times.

Jakesch et al. (2013) included different exposure times not to test the dual process model but to bring about different levels of fluency. The present study continues the work of Reber et al. (2004), Giora et al. (2004) and Jakesch et al. (2013) and tests the dual process assumption of Hekkert et al. (2003) by focusing on advertising images. Our research question is:

RQ: What is the influence of exposure time to the aesthetic response to familiar versus optimally innovative advertising images?

We expect to find an interaction effect (cf. Hekkert et al., 2003): a preference for familiar advertising images to optimally innovative images with little exposure time versus a preference for optimally innovative images to familiar images with more exposure time.

Method

An experiment was executed to test the effect of Exposure Time (20ms vs. 1000ms) * Type of Stimulus (familiar vs. optimally innovative stimuli) on the aesthetic response to the advertising image.

Pretest A pretest was done to select adequate familiar versus innovative stimuli. The second goal of the pretest was to determine the minimum exposure time (20, 50 or 100ms). The maximum exposure time in the experiment was set to 1000ms, as Jakesch et al. (2013, p.10) indicate that this relatively long exposure time yields more pronounced liking scores. In the pretest, eight sets of familiar versus optimally innovative advertising images were tested with 65 participants (others than in the main experiment), with Exposure Time and Type of Stimulus both as between-subjects factors. After each ad, the participants were asked which product and brand they had seen. Then, they were asked to indicate the perceived innovativeness of the stimulus by means of three 5-point semantic differentials: ‘The advertising image is familiar-innovative, predictable-original, straightforward-creative’. The extent of felt fluency was measured through two 5-point semantic differentials ‘It doesn’t take effort/takes effort to understand what is depicted’ and ‘The ad is easy/difficult to recognize’. Three out of the eight pre-tested ad pairs were selected for the main experiment: Heinz ketchup, Fructis shampoo and Lu Pim’s
cookies. The innovative versions of these ads were perceived as more innovative than the familiar versions and the innovative versions were perceived as less fluent to process than the familiar versions. An ad pair of Tropicana orange juice was added to the main experiment. This ad pair was used in a previous experiment (Van Enschot, 2006), in which the innovative version was perceived as more creative than its familiar counterpart. 20ms was selected as the minimum exposure time. At 20ms, almost all participants were able to recognize the product and brand in the images of the selected ads.

**Material** Four advertisements of real brands (Heinz ketchup, Fructis anti-dandruff shampoo, Lu Pim’s cookies and Tropicana orange juice) were presented. The images were manipulated to create a familiar version versus an optimally innovative version (see Figure 1-4: left is familiar, right is optimally innovative). The amount of text was limited. All familiar versions showed the product only. The innovative versions showed the product, but in a fusion with another element to create a meaningful twist (cf. Phillips & McQuarrie, 2004). Figure 1, for example, shows the ad pair of Heinz ketchup. The right ad is the optimally innovative version, in which the product is still shown (the familiar meaning) but an innovative aspect is added: The bottle of ketchup is depicted as a sliced tomato, illustrating the freshness of this ketchup. And the innovative version of the Fructis pair shows a fusion of the bottle of shampoo and a vacuum cleaner, to indicate that this shampoo removes all dandruff.

**Participants** 157 respondents filled in the questionnaires: age 16-80 (M=30.4), male-female ratio 66.2-33.8%, education level from lower to higher vocational education (mainly higher vocational education: 73.9%).

**Instrumentation** To measure the aesthetic response to the advertising images, four 7-point semantic differentials were used: beautiful-ugly, pleasurable-unpleasurable, interesting-not interesting, like-dislike (average Cronbach’s $\alpha = .94$). A manipulation check was performed by means of three 7-point semantic differentials: ‘The advertising image is familiar-innovative, predictable-original, straightforward-creative’) (average Cronbach’s $\alpha = .87$). The extent of felt fluency was measured with two 7-point semantic differentials: ‘It doesn’t take effort/takes effort to understand what is depicted’ and ‘The ad is easy/difficult to recognize’ (average Cronbach’s $\alpha = .86$). The items were largely based on Jakesch et al. (2013), Giora et al. (2004), Palmer et al. (2013) and Hekkert et al. (2003).

**Design** A mixed design was used with Exposure Time (20 vs. 1000 ms) as between-subjects factor and Type of Stimulus (familiar versus optimally innovative advertising image) as within-subjects factor. This led to four versions in which the order was kept constant. The image pairs were balanced across participants: Participants saw either the familiar image or the optimally innovative image of the pair.

**Procedure** The online survey software of Qualtrics (www.qualtrics.com) was used. Participants were randomly referred to one of the four versions. A practice ad (Karvan Cevitam, familiar version) was presented first. The aesthetic response and felt fluency were measured after limited exposure to the ads (20ms or 1000ms). The manipulation
check was performed in the second phase of the experiment, after a self-paced exposure to the ads. It took the participants 10 to 15 minutes to complete the questionnaire. As the questionnaire was online, participants were asked whether they were disturbed while filling in the questionnaire (85.5% not disturbed), whether their Internet connection was stable (92.4% stable) and whether they were focused on filling in the questionnaire (96.8% focused). These factors did not affect the aesthetic response (disturbed: $t (155) = .68, p = .489$; Internet connection: $t (155) = .01, p = .996$; focused: $t (155) = .85, p = .398$).

### Results

**Manipulation check** Perceived innovation was tested with a one-way ANOVA with Type of Stimulus as a factor. A main effect was found of Type of Stimulus ($F (1, 156) = 369.90, p < .001$). Optimally innovative images ($M = 4.96, SD = 1.24$) were indeed regarded as more innovative than the familiar images ($M = 2.34, SD = 1.13$).

The effects on felt fluency and the aesthetic response can be found in Table 1.

<table>
<thead>
<tr>
<th>Type of Stimulus</th>
<th>Felt fluency</th>
<th>Aesthetic response</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Familiar</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20ms</td>
<td>2.05 (1.06)</td>
<td>3.99 (0.96)</td>
</tr>
<tr>
<td>1000ms</td>
<td>2.19 (1.23)</td>
<td>5.05 (1.68)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2.12 (1.14)</td>
<td>4.51 (1.45)</td>
</tr>
<tr>
<td><strong>Optimally innovative</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20ms</td>
<td>3.31 (1.44)</td>
<td>4.30 (1.13)</td>
</tr>
<tr>
<td>1000ms</td>
<td>2.93 (1.36)</td>
<td>5.67 (1.18)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3.12 (1.41)</td>
<td>4.98 (1.34)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2.68 (1.41)</td>
<td>4.14 (1.06)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2.56 (1.34)</td>
<td>5.36 (1.50)</td>
</tr>
</tbody>
</table>

**Felt fluency** A two-way ANOVA with repeated measures was done to measure the effect of Type of Stimulus and Exposure Time on the extent of felt fluency. An interaction effect was found of Type of Stimulus * Exposure Time ($F (1, 155) = 4.35, p = .039$). The difference in the extent of felt fluency was present at 20ms ($F (1, 79) = 48.62, p < .001$) as well as at 1000ms ($F (1, 76) = 16.87, p < .001$): The familiar images were perceived as slightly more fluent at 20ms ($M = 2.05, SD = 1.06$) than at 1000ms ($M = 2.19, SD = 1.23$); the optimally innovative images were perceived as less fluent at 20 ms ($M = 3.31, SD = 1.44$) than at 1000 ms ($M = 2.93, SD = 1.36$). A main effect was found of Type of Stimulus ($F (1, 155) = 61.53, p < .001$). Optimally innovative images ($M = 3.12, SD = 1.41$) were experienced as less fluent to process than familiar images ($M = 2.12, SD = 1.14$). No main effect was found of Exposure Time ($F (1, 155) < 1$).

**Aesthetic response** A similar ANOVA was performed for the aesthetic response. We found a main effect of Type of Stimulus ($F (1, 155) = 14.51, p < .001$) and a main effect of Exposure Time ($F (1, 155) = 58.42, p < .001$). The aesthetic response to the optimally innovative images was higher than the familiar images and it was higher when the exposure time was 1000 ms than when it was 20ms. However, there was no interaction effect of Type of Stimulus * Exposure Time ($F (1, 155) = 1.61, p = .206$).

### Conclusion and Discussion

This study focused on two conflicting lines of research: Reber et al.’s fluency theory versus the Optimal Innovation work of Giora et al. (2004). Hekkert et al. (2003) suggest that two opposing underlying mechanisms could be at work: A fluency based gut response and preference for familiar stimuli versus a more cognitively mediated mechanism explaining a preference for optimally innovative stimuli. Exposure time was varied to test this assumption.

In our study, exposure time did not affect the aesthetic preference for either familiar or optimally innovative advertising images. The optimally innovative images were overall liked more than the familiar images and liking scores were higher at 1000ms than at 20ms, despite the fact that the felt fluency of the familiar versions was higher than of the innovative versions. Where Jakesch et al. (2013) did not find any differences in liking for the short exposure times, our findings even showed an effect in the opposite direction, with higher liking scores for the optimally innovative stimuli.

Our findings do not back Reber et al.’s (2004) processing fluency theory nor do they provide evidence for Hekkert et al.’s (2003) dual process model. An explanation may be found when looking at the optimally innovative stimuli in this study. Despite the fact that the optimally innovative stimuli were processed less fluently than the familiar stimuli (as expected), all stimuli – familiar and optimally innovative - were regarded as rather easy to process; all scores were on the fluent side of the scale. It may be that the optimal tipping point of the inverted U-curve (cf. Berlyne, e.g., 1974) was not reached yet. A follow-up study that would use several levels of innovation (cf. Giora et al., 2004), which would put different spins on the familiar, so to speak, is necessary to be able to put fluency theory and Hekkert et al.’s dual process model further to the test. Familiar stimuli may be preferred more than more complex, more innovative stimuli when processing time is limited, whereas the more complex stimuli – as the optimally innovative stimuli in this study - would be preferred more with ample processing time.

Fluency theory distinguishes perceptual and conceptual fluency. By using images with familiar versus innovative meanings, the present experiment focused on conceptual fluency: “the ease of mental operations concerned with
stimulus meaning and its relation to semantic knowledge structures” (Reber et al., 2004, p.366). However, fluency theory is mainly supported by studies on perceptual fluency, which concerns the ease of identifying the physical identity of the stimulus (p.366). Studies on advertising images may also depart from perceptual fluency. We may think of studies in which advertising images are constructed based on Gestalt principles (see, e.g., Wagemans et al., 2012) such as symmetry, figure-ground contrast and goodness-of-form. Good Gestalts, i.e., easily identifiable stimuli, can be compared with stimuli that creatively bend the Gestalt principles, for example by cropping an advertising image (cf., e.g., Wang & Peracchio, 2008). It may be that fluency theory only holds for perceptual fluency, in the advertising domain at least.

We might also want to look at the domains under study. Art (in Jakesch et al., 2013) and advertising are relatively safe domains, rather detached from the real world. The preference for fluently processed stimuli may apply more in real-world situations; Reber et al. (2004) point out that high fluency may “feel good because it signals that an external stimulus is familiar, and thus unlikely to be harmful” (p.366). However, art and advertising offer, as Jakesch et al. (2013) put it, “a fictitious playground to ‘train’ problem solving and resolving ambiguity in real-world scenarios” (p.12). We are allowed to interpret freely; no ‘danger’ or punishment is involved when making mistakes.

This study has expanded theory development to the advertising domain. It also gives us more insight into the paradox between Reber’s fluency theory and Giora et al.’s (2004) Optimal Innovation Hypothesis.

Acknowledgments

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References


Axiological Approaches to Aesthetic Experience in Neuroaesthetics

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Abstract
Recent approaches in neuroaesthetics appeal to reward and pleasure mediating systems to explain the distinct character of aesthetic experience. In this paper I review studies that (a) claim that in aesthetic experience we employ a liking system without a wanting system (Chatterjee 2014); (b) propose a separation of early and late aesthetic systems related to different values (Cela-Conde et al. 2013); and (c) show how intense aesthetic liking involves exteroceptively driven self-evaluation (Vessel et al. 2013). I argue that these studies support a theory that can provide an alternative to more traditional axiologically-oriented approaches in philosophical aesthetics that claim that aesthetic experience is essentially valued for its own sake (Carroll 2002).

Keywords: aesthetic experience; neuroaesthetics; axiological approaches; philosophical aesthetics; aesthetic value; DMN.
The Pleasure of Ambiguity

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Abstract

In art theory, it is claimed that a main component of arts is ambiguity. But why is ambiguity appreciated in the arts when it is mostly disliked in everyday life? One explanation is that while in our everyday life an ambiguous situation might cause harm, the safe context of an aesthetic episode allows for indulging in such challenges. Nonetheless, the "processing-fluency-account" suggests that we prefer stimuli, which are easy to process. Thus, we tested whether ambiguous pictures receive higher aesthetic evaluations in an explicit rating task, but also implicitly evoke more positive emotions. Our results show that in the arts ambiguity can be appreciated, but it takes some time for the pleasure to unfold. Furthermore, individual differences modulate this appreciation.

Keywords: ambiguity; aesthetic appreciation; processing fluency; art; facialEMG;

Introduction

In our everyday lives, ambiguous situations are mostly negative. When faced with contrasting information, uncertainty emerges. Unclear traffic signs are only one example where ambiguity could cause serious harm. Besides the issue of safety, contrasting information is also annoying and leads to negative affect. Interestingly in the realms of art, ambiguity could have an inverse effect. Here, ambiguity could even elicit interest and pleasure. In two studies, we therefore tried to assess this paradox of ambiguity in the arts. With measures of both subjective ratings and physiological activation, we assessed the responses of participants to ambiguous and non-ambiguous artworks.

Types of Ambiguity

Ambiguities can arise at various levels during a cognitive process. Early, at a perceptual level, it can be argued that all the light patterns falling on our retina are per se ambiguous. How well these ambiguities can be resolved depends on both the percept and the facilities of the perceiver’s perceptual system. With multi-stable and reversible images, such as the classical duck-rabbit figure (McManus, Freegard, Moore, & Rawles, 2010), early sensory ambiguities can be studied. These images with at least two possible visual interpretations are also incorporated in the arts, for example in the works of M. C. Escher.

Later, at higher-level processes of meaning making and interpretation, cognitive ambiguities arise. Especially the playful use of word meanings (metaphors) or works of René Magritte are instances of these ambiguities in the artistic domain.

Responses to Ambiguity

In general, to successfully act and survive in our environment we need to effectively structure the world around us. Only then, we can act and react adequately on the affordances of the environment. Examples of danger due to ambiguity are unclear road signs or driving under foggy weather conditions. Those situations are potentially dangerous and afford greater attention. When something is unclear we furthermore tend to get frustrated and annoyed. One possible explanation for this arising negative affective response gives the theory of processing fluency (Reber, Schwarz, Winkielman, 2004). The account states that the easier something is processed, the more it is liked (see also Forster, Leder & Ansorge, 2013). Or, put the other way around, the harder something is processed the less it is liked. This converges with the idea of ambiguity, where ambiguous objects or situations challenge our processing. Thus, for perceiving and appreciating a work of art the processing fluency account would predict that the challenge due to ambiguity leads to a negative reaction and thus to disliking of the artwork (but see Bullot & Reber, 2012, for a possible explanation).

The Present Study

Thus, we performed a series of experiments to pit the predictions of the processing fluency account against art theory. We tested how the presence or absence of ambiguity influences the aesthetic appreciation in terms of both physiological responses of the facial muscles, indicative of affective responses, and subjective ratings of liking and interest.

General Method

Stimuli

In the present study, we used 36 pairs of pictures plus a set of 32 distractor images. Each pair consisted of an original Magritte painting (ambiguous) and a manipulated (non-
ambiguous) version of it. For the manipulated versions, in Adobe Photoshop CS3, we “corrected” the ambiguity to render the painting non-ambiguous in order to provide a fair control condition. For example, objects which were placed in an uncommon way (e.g. the Engagement ring around the grand piano in the painting “La main heureuse, 1953”) were either removed (in this example the ring) or modified. Or in “Le Modele rouge, 1947”, where parts of the foot and the toes are combined with brown shoes, the toes were replaced by a “full version” of the shoes. Therefore, we ensured that the original and the manipulated version only differed in terms of ambiguity. The picture pairs were balanced across participants. This means a person saw either the original, ambiguous picture or the manipulated, non-ambiguous counterpart. In a pre-study, 22 participants (Mean age: 24.85 years; 14 women) rated 50 pairs of these artworks on complexity, mood content, and ambiguity on 7-point scales. For the main experiments, the picture pairs had to meet the following criteria: a) the picture pairs significantly varied in their ambiguity, i.e. significantly higher ambiguity ratings for the original picture than for the manipulated version, b) medium mood content (mean within the range of 3.0 and 4.0), and c) similar subjective complexity (mean within the range of 3.0 and 4.0). Moreover, 32 distractor images (16 surrealistic = ambiguous; 16 realistic = non-ambiguous) were presented that participants were not able to make assumptions concerning the main hypotheses. Responses to distractors were excluded from later analyses. The images measured 269 × 390 pixels (portrait format) or 390 × 269 pixels (landscape format) with a resolution rate of 100 dpi. Example stimuli and data are available from the corresponding author upon request.

**General Procedure**

In all studies, participants were tested individually or in groups of two in the laboratory. In the behavioral studies the stimuli were presented on 21-in CRT monitors with refresh rates of 100-Hz controlled by the experimental software e-prime (Schneider, Eschman, & Zuccolotto, 2002). In the psychophysiological study stimuli were presented on a 30-in LCD monitor with a refresh rate of 60-Hz controlled by e-prime. In all studies the stimuli subtended 10° × 15° (portrait format) or 15° × 10° (landscape format) of visual angle. Prior to the experiment, we tested visual acuity and color vision (Ishihara color plates) in the participants.

In all experiments, participants first were familiarized with the task in practice trials. As shown in Figure 1, the general trial procedure was similar in Experiments 1a to d: A trial started with a fixation cross for 150ms, followed by a 80ms blank screen. Then the stimulus was presented: in Experiment 1a 10ms or 50ms, 1b 10ms or 100ms, 1c 10ms or 500ms and 1d 100ms or 1000ms. The presentation durations were varied within participants. Then, a 80ms blank screen was presented followed by a 200ms random noise mask covering the entire screen. Finally, the responses were prompted: the keyboard was used to measure responses from 1 to 7 to the scales liking (How much do you like the current picture?, 1 not at all to 7 very much), interest (How interesting is the current picture?, 1 not interesting at all to 7 very interesting), and subjective fluency (How easy was it to perceive the current picture? 1 very hard to 7 very easy). The scales were presented in random order.

Due to the affordances of physiological measurements, in Experiment 2 the timing of the trial procedure was slightly different (see Figure 2). The fixation cross at the beginning of each trial was presented for 2000ms followed by the stimulus for 5000ms. Afterwards participants were asked to rate the subjective fluency and liking of the painting on a 7-point Likert-scale. The inter-trial interval (ITI) randomly varied between 3000 and 4000ms.

In all experiments, as a last block all pictures were rated on familiarity using a 7-point scale ranging from 1 not familiar at all to 7 very familiar (status before the experiment).

**Appreciation of Ambiguity – Subjective Reports: Experiments 1a to d**
The aim of the first series of experiments was to investigate the relationship between ambiguity/fluency and an aesthetic judgment. To compare the two fluency manipulations, ambiguous (original) and (manipulated) non-ambiguous Magritte paintings were presented at varying presentation durations.

Participants

Ninety participants with normal or corrected to normal vision took part for course credit ($M_{age} = 22.88 \text{ years}, SD = 3.49, 72$ women). None of the participants had a specific background in art. Prior to the experiment, we obtained written consent from each participant.

Design and Procedure

We used 2 (ambiguity: ambiguous versus non-ambiguous) \times 2 (duration) within-participants designs with liking, interest, and felt fluency as dependent measures. Due to the limited number of Magritte paintings we had to split the duration conditions. Therefore, in Experiment 1a we compared 10ms and 50ms, in $1b$ 10ms and 100ms, in $1c$ 10ms and 500ms, and in $1d$ 100ms vs. 1000ms.

### Results

#### Liking

The results of Experiments 1a to d are presented in Figures 3 and 4; significant effects ($p < .05$) are indicated with asterisks. For the sake of parsimony exacts statistics are omitted. As apparent in Figure 3 and 4, only in 1a, 1b, and 1d, the perceptual fluency manipulation through presentation duration influenced participants liking ratings. In 1a, b, and d ambiguous and non-ambiguous pictures received significantly higher liking ratings when presented longer. Only in Experiments 1c and d, the conceptual fluency manipulation modulated participants’ preferences: at 500ms and at 1000ms presentation duration, participants rated the ambiguous pictures as more likeable than non-ambiguous pictures. At shorter durations they did not.

#### Interest

For interest, the data pattern was consistent over all experiments: ambiguous pictures were rated significantly more interesting than non-ambiguous pictures under short as well longer durations. Moreover, the mean ratings of interest for ambiguous pictures increased significantly with longer presentation durations.

![Figure 3: Overview of effects in Experiments 1a, b, and c. Figure taken from (Jakesch, Leder, & Forster, 2013, p. 9).](image)
Felt fluency Also for felt fluency, the data pattern was quite consistent over all experiments: non-ambiguous pictures felt more fluent to process than ambiguous (Experiments 1a, b, and d). Moreover, the mean ratings felt fluency increased significantly with longer presentation durations.

Discussion
In accordance with assumptions about ambiguous art, we found that ambiguous paintings indeed could be appreciated. Effects in the favor of ambiguity were found for liking judgments starting at 500ms and interest judgments from 50 to 500ms.

The findings support the notion that optimal challenges can be experienced as self-rewarding and thus lead to a positive experience and satisfaction (Csikszentmihalyi & Csikszentmihalyi, 1992). Even though the felt fluency ratings indicate that ambiguous pictures were perceived harder, they still have the power to be appreciated and approached with interest.

Appreciation of Ambiguity – Electrified: Experiment 2
Until now, ambiguity as a source of pleasure in an art-specific context was only measured by asking for liking and interest. Thus, Experiment 2 aims to add evidence from physiological measures of emotional reactions. Topolinski, Likowski, Weyers, and Strack (2009) reported significantly higher Musculus zygomaticus major activity and lower Musculus corrugator supercilii activity for fluent compared to non-fluent stimuli. This activity pattern supports the common notion, that fluent stimuli are liked more than non-fluent stimuli. Therefore, we tested whether—even though ambiguous stimuli are rated as being significantly less fluent—they nevertheless elicit more positive reactions compared to non-ambiguous paintings at longer presentation durations.

Participants
Thirty-three female undergraduate students participated in exchange for course credit. The average age was 22.18 (SD = 3.30) years.

Design and Procedure
In order to explore and control for personal characteristics, a questionnaire was conducted after the fEMG recordings (see also Wang, Wang, Xu, Lui & Jiang, 2014). This questionnaire contained the Tolerance for Ambiguity Scale (TAS; Herman, Stevens, Bird, Mendenhall, & Oddou, 2010) and the German version of the Personal Need for Structure scale (PNS; Machunsky & Meiser, 2006).

In order to test for temporal aspects, the 5000ms presentation time of the stimuli the fEMG experiment was binned in five one-second bins. Thus, we used a 2 (ambiguity) × 5 (duration) within-participants design with z-standardized activities of the Musculus Zygomaticus and Musculus Corrugator regions as dependent variables. In addition, liking and fluency ratings acted as dependent variables in further analyses.

fEMG Analysis
Activities of the Musculus zygomaticus major and the Musculus corrugator supercilii were recorded throughout the whole session on the left side of the face using bipolar placements of 13/7 mm Ag/AgCl surface electrodes according to the guidelines established by Fridlund and Cacioppo (1986). The impedances of all electrodes were reduced to less than 10 kΩ. The EMG raw signal was measured with a biopotential amplifier (Refa8, TMS International BV, Enschede, Netherlands), digitalized by a 24-bit analogue-to-digital converter. Raw data were rectified offline and filtered with a 20 Hz low-cutoff filter, a 500 Hz high-cutoff filter, a 50 Hz notch filter, full-wave rectification, and a 125ms moving average filter. The EMG scores are expressed as change in activity from the pre-stimulus level, defined as the mean activity during the last second before stimulus onset. Conspicuous fEMG activity was compared with synchronized video material of the participants’ face. All trials, which contained activity putatively caused by artefacts not related to the experiment, were manually excluded. The remaining data were collapsed over all trials separately for ambiguous and non-ambiguous paintings.

Figure 4: Overview of effects in Experiment 1d. Figure taken from (Jakesch, Leder, & Forster, 2013, p. 10).
Results and Discussion

Ambiguity of the paintings had no influence on the muscle activation patterns of both the Musculus zygomaticus major and the Musculus corrugator supercilii. Also activation did not change over consecutive time intervals.

Running a repeated-measures analyses of variance (ANOVA) with ambiguity (ambiguous, non-ambiguous) and time (0-1000ms, 1000-2000ms, 2000-3000ms, 3000-4000ms, 4000-5000ms) as within-subjects factors and Zygomaticus activity as dependent variable reveals no significant effects, Fs < 1.685, ps > .204. This null finding could be due to differences in personal characteristics. Hence we additionally included responses to the two post-questionnaires in the analyses.

Tolerance for ambiguity Figure 5 shows the Zygomaticus activity separately for ambiguous and non-ambiguous paintings for participants with low, medium, or high tolerance for ambiguity. It seems that participants scoring low on tolerance for ambiguity show a difference in Zygomaticus activity for ambiguous vs. non-ambiguous paintings, whereas participants with a medium and high tolerance for ambiguity do not show this pattern. A mixed-model ANOVA with ambiguity (ambiguous, non-ambiguous) as a within-subjects factor and tolerance for ambiguity (low, medium, high) as a between-subjects factor, thus, revealed a significant ambiguity × tolerance for ambiguity interaction (see Figure 5). Post-hoc pairwise comparisons indicated a significant difference between ambiguous and non-ambiguous paintings for participants scoring low on tolerance for ambiguity (p = .010), but not for participants showing a medium (n.s.) or a high tolerance for ambiguity score (n.s.).

Personal need for structure Figure 6 shows the Zygomaticus activity separated for ambiguous and non-ambiguous paintings for participants with low, medium, or high personal need for structure. Again, the results indicate an interaction. Participants with a high personal need for structure show a difference in Zygomaticus activity between ambiguous and non-ambiguous paintings, whereas participants with a low or medium personal need for structure do not show these differences. The findings mirror the effects of tolerance for ambiguity; mind that tolerance for ambiguity and personal need for structure have a reversed polarity. A low tolerance for ambiguity and a high personal need for structure are indicative of ambiguity aversion. Running a mixed-model ANOVA with ambiguity (ambiguous, non-ambiguous) as a within-subjects factor and personal need for structure (low, medium, high) showed a significant ambiguity × personal need for structure interaction. Post-hoc pairwise comparisons indicated a significant difference between ambiguous and non-ambiguous paintings for participants showing a high personal need for structure (p = .006), but not for participants showing a medium (n.s.) or low personal need for structure (n.s.).

General Discussion

The present study examined behavioral responses (aesthetic judgments, felt fluency) and physiological responses to ambiguity (ambiguous versus non-ambiguous).

Our experiments regarding the appreciation of ambiguity show that starting at 50ms presentation duration ambiguous artworks were judged as more interesting and, at 500ms presentation duration, were preferred over non-ambiguous stimuli. Surprisingly, conceptual fluency due to ambiguity influenced the interest ratings in the favor of ambiguous
pictures much earlier than liking. Despite being preferred, the ambiguous artworks were nonetheless rated as harder to process at all presentation durations.

In the subsequent facial EMG study, physiological measurements allowed investigating the time course and the dynamic changes of the affective response in more detail. Although no straightforward differences in affective reactions between ambiguous and non-ambiguous artworks were found, post-hoc analyses indicate that personality factors, here tolerance for ambiguity and personal need for structure, modulated the effects (see also Wang, Wang, Xu, Lui & Jiang, 2014). In line with the “processing fluency account”, participants with lower tolerance for ambiguity scores responded more positively to non-ambiguous artworks. Participants with higher tolerance for ambiguity scores, on the other hand, responded more positively to ambiguous artworks. Therefore, whether ambiguity or higher processing fluency is appreciated in the arts seems to be influenced by personality characteristics.

Although the present set of stimuli was homogenous and therefore conclusions are limited, our results show that in the arts ambiguity can be appreciated. The reason for the pleasure of ambiguous art might be that especially in the arts the challenge of ambiguity is typically experienced in a save context of the museum (Ramachandran & Hirstein, 1999). This playful aspect of aesthetic experience might even be evolutionary essential, as it comprises a fictitious playground to “train” problem solving and resolving ambiguity for real-world scenarios (Tooby & Cosmides, 2001). Our results further show that it takes some time for the pleasure to unfold. Individual differences in subtle implicit positive reactions indicate that this appreciation might be inhibited until an individual interpretation is found. Therefore, ambiguity in the arts may be preferred, just because ambiguous artworks are harder to process, supposing you are up for this challenge.

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Note

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Revisiting the Effects of Sad Emotion on Music Preference

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Abstract
Recent findings regarding the influence of sad mood on music preference have been inconsistent, with some research suggesting that sadness promotes selective exposure to happy music and other work suggesting the very opposite. In two experiments, we investigated whether this discrepancy may have resulted from differences in the extent to which sadness was elicited by having participants think about personally-relevant versus personally-irrelevant negative events. To this end, we manipulated sad mood via a guided visualization technique in which participants were led to imagine experiencing a loss that was relevant either to their own or to an unfamiliar individual’s concerns. Results revealed that irrespective of the self-relevance of the mood induction, individuals in sad, relative to happy or neutral, moods preferred to avoid expressively happy music. This aversion was partially mediated by beliefs that choosing happy music while sad would be inappropriate and thereby ineffectual in mood repair. Together, these findings contribute to resolving discrepancies in the literature and help advance understanding of the influence of mood on music choice.

Keywords: emotion, mood management, music, preference, sadness.

Introduction
Empirical studies investigating the influence of mood on selective exposure to music have produced markedly discrepant findings. For instance, in a seminal study, Knobloch and Zillmann (2002) induced individuals to either feel positive, neutral, or negative moods via false feedback on an ostensible test of social sensitivity. Afterward, they gave participants several minutes to freely select from a set of musical recordings that had been pre-tested to be either expressively joyful or sad. Consistent with “classic” mood management theory, the findings revealed that individuals in negative, relative to positive, moods spent more time listening to happy than to sad songs, presumably in order to restore their good spirits. However, other research has produced results that are ostensibly at odds with those of Knobloch and Zillmann (2002). For instance, Friedman, Gordis, and Förster (2012) manipulated mood via emotionally-evocative film clips and then assessed participants’ preferences for expressively happy versus sad musical selections. They also asked participants to indicate how they believed listening to each song would affect their current emotional state, as well as how appropriate they felt it would be to choose a given song. Friedman et al. (2012) found that individuals in sad moods were not reliably inclined to listen to expressively sad music, but rather, were clearly disinclined to listen to expressively happy music, apparently out of concern that choosing such music would seem inappropriate and ultimately fail to improve their mood.

Upon consideration, discrepancies in the findings of these and related studies may be due to differences between the experimental emotion-induction procedures used in each study. For example, whereas Friedman et al. (2012) induced sadness using a feature film clip depicting a young boy’s reaction to a parent’s death, Knobloch and Zillmann (2002) manipulated negative mood by means of bogus failure feedback on a test of an important personality trait. One potentially significant distinction between these methods is that whereas the negative feedback in the latter manipulation has profound bearing upon participants’ personal interests, the plight of the young boy in the film-based induction has no personal ramifications for participants outside of the empathic feelings it evokes. Theoretically speaking, there are at least two reasons why experiencing or imagining adverse events directly related to personal concerns may be more likely to prompt efforts at mood repair via consumption of expressively happy music. First, in the majority of cases, negative events that involve the self may simply be more emotionally painful than those that are not directly self-relevant, rendering individuals more motivated to alleviate their discomfort via the positive affect and/or distraction that consumption of happy music might afford. Second, to enable empathy, individuals may be socialized to maintain rather than change their negative feelings when the emotion-eliciting event is relevant to another person’s concerns. This suggests that sad mood may prompt selective exposure to happy music when sadness is due to personal loss, yet prompt selective exposure to sad music and/or aversion to happy music when the sadness-eliciting event is not self-relevant.

To assess this possibility, an initial experiment manipulated self-relevant sadness using a guided visualization in which participants were led to imagine experiencing a profound personal loss. Following the induction, participants were asked to identify the song they most felt like hearing at the moment and to rate the extent to which it expressed happiness versus sadness. If sad participants, relative to those in a neutral-mood control group, opted for expressively happy music, this would suggest that mood repair via selective exposure to happy music may be uniquely triggered by self-relevant sadness.
Experiment 1

Method

Participants Participants were 12 male and 35 female undergraduates between the ages of 19 and 40 (M = 21.70; SD = 4.18) who participated in exchange for course credit in an introductory psychology course at a state university in the northeastern US.

Mood Induction Participants assigned to the Sad Mood group were first led to relax and then to visualize themselves as 8-year-old children experiencing a series of events culminating in their mother’s death (a highly self-relevant event). This fictitious autobiographical narrative was presented via an approximately 3-min long audio recording in which it was slowly read aloud by a female graduate student. Participants assigned to the Neutral Mood control group were led to visualize themselves as 8-year-olds making a collage out of construction paper, an exercise expected to evoke little emotion.

Measures Following the mood induction, participants were administered two manipulation check items. The first item assessed whether participants complied with instructions to visualize the narrative from their own perspective: “To what extent did you visualize yourself in the scene?,” with points labeled 1(I visualized myself the entire time.), 2(I sometimes visualized another child instead of myself.), 3(I often visualized another child instead of myself.), and 4(I visualized another child instead of myself almost the entire time.). The second item assessed the success of the mood induction: “How do you feel right now?,” with points labeled 0(Very Sad), 2(Moderately Sad), 3(Slightly Sad), 4(Neither sad nor happy), 5(Slightly Happy), 6(Moderately Happy), and 7(Very Happy).

Afterwards, participants were asked, “How much do you feel like listening to music right now?,” on a 7-point scale anchored at 1(Not at all) and 7(Very much). Next, to assess their specific music preferences, participants were asked, “If you could choose any song to listen to right now, what would it be?” Upon tendering a response, participants were presented with two items designed to determine the subjective expressive quality of their selection: “On average, was the song you chose ‘happy’ or ‘sad’?,” anchored at -3(very sad) and +3(very happy), with the midpoint labeled 0(neither happy nor sad); and, “On average, was the song you chose ‘slow’ or ‘fast’?,” anchored at -3(very slow) and +3(very fast), with the midpoint labeled 0(average speed).

A final set of items were included to probe the motivational underpinnings of participants’ music choices. First, participants were asked, “How would listening to this song make you feel right now?,” on a 7-point scale labeled -3(much worse), -2(moderately worse), -1(slightly worse), 0(no change in mood), 1(slightly better), 2(moderately better), 3(much better). Second, participants were asked to indicate the extent to which the song they chose expressed feelings of hope and of optimism on 7-point scales anchored at 1(not at all) and 7(very much).

Procedure Upon arrival at the lab, each participant was led to a computer workstation inside a private soundproof chamber. Participants were told that they would be listening to an audio recording, after which they would be asked to complete a short questionnaire in order to assess their “imaginative visualization” of the material. At that point, they were asked to put on headphones and were administered the mood induction. Random assignment of participants to either the Sad or Neutral Mood groups was accomplished automatically via computer. Following the mood manipulation, all participants were administered the dependent measures in the order in which they are detailed above.

Results and Discussion

Raw descriptive statistics for all measures are displayed in Table 1. According to a t-test, the visualization exercise was equally successful in leading participants in both the Sad and Neutral Mood groups to imagine the events in the narrative from their own perspective, t < 1. As expected, the groups did differ in their self-reported affect, with those in the Sad Mood group feeling significantly sadder than those in the Neutral group, t(44) = 10.64, p < .001, suggesting that the mood induction was effective.

In terms of their music preferences, participants in both the Sad and Neutral Mood conditions reported at least a moderate desire to listen to music. These ratings did not reliably differ between groups, p > .08. However, there were significant between-groups differences in the expressive quality of the specific songs that participants wished to hear with those in the Sad Mood condition choosing songs that were not as expressively happy as songs chosen by those in the Neutral group, t(37) = 3.10, p < .004. There was no reliable between-groups difference in the subjective tempo of songs chosen, p > .48. These results suggest that sad mood may prompt an aversion to listen to songs that express happiness and may do so even if the sadness-eliciting event is relevant to personal concerns, in this case, the death of a significant other.

With regard to our supplemental measures, results also suggested that participants in the Sad, relative to the Neutral, group were significantly less likely to believe that the song they selected would change their mood for the better, t(32) = 3.26, p < .03. In fact, on average, sad participants’ responses on the anticipated mood change measure did not reliably differ from the neutral midpoint of the scale, p > .17. This suggests that those in the Sad Mood condition expected that listening at that particular moment to the song that they had chosen would not tangibly alter their current feelings.

However, assuming that sad participants avoided selecting music that would have facilitated mood repair, what motivated the particular choices they did make? Interestingly, as shown in Table 1, participants in the Sad Mood condition did rate the songs they had chosen as fairly expressive of hope and optimism. Moreover, the amount of hope and optimism expressed by these songs was not reliably different
Table 1: Descriptive statistics for measured variables indexed by mood (Experiment 1).

<table>
<thead>
<tr>
<th>Measure</th>
<th>Sad</th>
<th>Neutral</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How much do you feel like listening to music right now?</td>
<td>4.14 2.48</td>
<td>5.27 1.73</td>
</tr>
<tr>
<td>2. On average was the song you chose ‘happy’ or ‘sad?’”</td>
<td>-0.52 2.04</td>
<td>1.15 1.57</td>
</tr>
<tr>
<td>3. On average was the song you chose ‘slow’ or ‘fast’?</td>
<td>-0.48 2.14</td>
<td>-0.08 1.60</td>
</tr>
<tr>
<td>4. How would listening to this song make you feel right now?</td>
<td>0.52 1.72</td>
<td>1.54 1.07</td>
</tr>
<tr>
<td>5. To what extent does the song you chose express feelings of hope?</td>
<td>4.90 1.64</td>
<td>4.81 2.15</td>
</tr>
<tr>
<td>6. To what extent does the song you chose express feelings of optimism?</td>
<td>4.67 1.77</td>
<td>4.81 1.90</td>
</tr>
<tr>
<td>7. Manipulation Check 1: To what extent did you visualize yourself in the scene?</td>
<td>1.67 0.91</td>
<td>1.54 0.86</td>
</tr>
<tr>
<td>8. Manipulation Check 2: How do you feel right now?</td>
<td>1.90 0.89</td>
<td>4.77 0.95</td>
</tr>
</tbody>
</table>

from that expressed by the relatively happy songs chosen by participants in the Neutral condition.

One limitation of Experiment 1 was that it did not include a condition in which the emotion-triggering event was “other-relevant”, as opposed to self-relevant, and which thereby had no direct bearing on the participant’s personal concerns. To enable direct comparison of the effects of self-relevant versus other-relevant sadness on music preference, we constructively replicated Experiment 1, appending a new condition in which participants visualized the same events happening to an unfamiliar child. In addition, we newly included a condition in which happy mood was induced. Finally, for the sake of convergent validity, we employed a slightly different dependent measure of preference for expressively happy versus sad music: Rather than directing participants to freely enter the title of the song they wished to hear, participants were asked to rate their preferences for listening to a pre-selected set of their favorite happy and sad songs.

**Experiment 2**

**Method**

**Participants** Participants were 87 male and 85 female undergraduates between the ages of 17 and 29 (M = 18.83; SD = 1.28) who participated in exchange for course credit in an introductory psychology course at a state university in the northeastern US.

**Mood Induction** The mood induction used was the same as that administered in Experiment 1 with the following exceptions: First, participants randomly assigned to the Other-Relevant condition were shown a photograph of an unfamiliar young girl of ambiguous ethnicity wearing an affectively neutral expression and led to imagine the events described in the audio narrative as happening to her. Second, participants assigned to the Happy Mood condition were led to either visualize themselves as children (Self-Relevant) or to visualize the child in the photograph (Other-Relevant) experiencing events culminating in the birth of their own/the unfamiliar child’s baby brother.

**Measures** Manipulation check items were the same as in Experiment 1, except that for participants in the Other-Relevant condition, the check on the success of the visualization procedure was modified to read, “To what extent did you visualize the child from the picture in the scene?,” with points labeled 1(I visualized the child the entire time.), 2(I sometimes visualized myself instead of the child.), 3(I often visualized myself instead of the child.), and 4(I visualized myself instead of the child almost the entire time.). Prior to the mood induction, participants were requested to enter the titles of 2 of their favorite happy/energetic songs as well as 2 of their favorite sad/mellow songs. After the mood induction, participants were asked how much they felt like listening to music and then the 4 songs that they had entered earlier were randomly re-presented by the computer one at a time and participants were asked to rate how much they felt like listening to each song at that moment on a 7-point scale anchored at 1(not at all) and 7(very much). Ratings of each set of 2 like-valenced songs were highly correlated and therefore averaged to form composite happy and sad song preference indices. Participants were also administered 3
additional self-report items pertaining to their music selections. Specifically, they were asked, “How would listening to this song make you feel right now?” on a 7-point scale labeled -3(much worse), -2(moderately worse), -1(slightly worse), 0(no change in mood), 1(slightly better), 2(moderately better), 3(much better). Moreover, participants were asked how (in)appropriate it would feel to listen to each song (“Listening to this song right now would feel:”) on a 7-point scale with endpoints labeled -3(very inappropriate) and 3(very appropriate) and a midpoint of 0(neither appropriate nor inappropriate), as well as how right/wrong it would feel to listen to each song, with endpoints labeled -3(very wrong) and 3(very right) and a midpoint of 0(neither right nor wrong). For each type of song (happy versus sad), the latter two measures were very highly correlated; therefore, they were collapsed to create composite measures of happy-song and sad-song appropriateness.

Procedure Participants were first asked to enter the titles of their favorite happy and sad songs on the computer. This was followed by the mood induction (Happy vs. Neutral vs. Sad). Afterward, participants were re-presented with each song title in random order and asked to complete the survey items regarding their music preferences in the order of their description above.

Results and Discussion

Raw descriptive statistics for all measures are displayed in Table 2. According to the results of the first manipulation check, participants were quite successful on average in following the visualization instructions, with 72.67% of them reporting a perfect (1) and 22.09% reporting a near-perfect (2) ability to imagine the events in the narrative from the required perspective. According to a Mood (Happy vs. Neutral vs. Sad) X Relevance (Self vs. Other) Analysis of Variance (ANOVA), self-reported adherence to the visualization instructions did not differ by Mood; however, those in the Other-Relevant condition (M = 1.20, SD = 0.43) were slightly, albeit reliably, more successful than those in the Self-Relevant condition (M = 1.51, SD = 0.78). With regard to the second manipulation check, a two-way ANOVA revealed only a main effect of Mood, suggesting that the mood manipulation led to a reliable difference between groups, F(2, 166) = 69.64, p < .001: Pairwise comparisons revealed that participants in the Sad Mood group felt significantly sadder than those in the Happy and Neutral groups combined, F(1, 166) = 134.43, p < .001, whereas those in the Happy Mood group were happier than those in the Neutral group, although this difference was not quite reliable, F(1, 166) = 3.69, p = .056.

In terms of their music preferences, as in Experiment 1, participants in all conditions, including the Sad Mood group, reported at least a moderate desire to listen to music following the mood induction (M = 5.12; SD = 1.73), with a two-way ANOVA revealing no main effects of either Mood or Relevance. However, there were significant between-groups differences in preferences for expressively happy versus sad music. Specifically, an ANOVA on the preference index for self-selected happy songs revealed a reliable main effect of Mood, F(2, 166) = 11.44, p < .001. Pairwise comparisons showed that this was due primarily to the aversion among participants in the Sad Mood condition (M = 3.70; SD = 2.03) to listen to happy songs, relative to those in the remaining groups (M = 4.97; SD = 1.50). The difference between the Happy and Neutral groups was nonsignificant, p > .48. These results converge with those of Experiment 1 to suggest that sad mood shapes music preference in part by fostering a tendency to avoid listening to happy/upbeat songs. In contrast, an ANOVA on the preference index for self-selected sad songs revealed no reliable effects, although there was a nonsignificant trend for those in the Happy Mood group to express less favorability toward sad music.

To elucidate the forces instigating sad participants’ aversion to happy music, we examined the results of our supplementary self-report measures. Here, we first analyzed participants’ predictions regarding how happy versus sad songs would impact their mood state. An ANOVA revealed that Mood reliably affected judgments regarding the hedonic impact of listening to happy songs, F(2, 166) = 15.37, p < .001. According to pairwise comparisons, this effect was driven by participants in the Sad Mood group (M = 0.56; SD = 1.25), who felt that listening to happy songs would be ineffective in improving their mood relative to those in the Happy and Neutral groups combined (M = 1.50; SD = 0.95), F(1, 166) = 30.36, p < .001. A corresponding ANOVA on judgments regarding the hedonic impact of listening to sad songs revealed no reliable effects. As indicated by Table 2, across conditions, participants generally believed that sad songs would have made them feel slightly worse. (According to a one-sample t-test, the grand mean of -.38 was reliably different from the neutral midpoint of the scale [0], t(171) = 4.45, p < .001).

To help account for why participants in the Sad Mood group believed that happy songs would fail to improve their mood, we examined responses to our measure of the appropriateness of listening to expressively happy music. According to Friedman et al. (2012), sad individuals might intuit that selecting happy music would feel inappropriate or wrong in light of the events that precipitated their sadness (here, imagining the tragic death of their own or an unfamiliar child’s mother). This sense of imp propriety or incongruity might lower their expectations regarding the hedonic benefits of listening to expressively happy music, thereby leading them to express diminished preference for happy songs. In line with this hypothesis, an ANOVA on happy-song appropriateness scores revealed a main effect of Mood, F(2, 166) = 33.76, p < .001, which according to pairwise comparisons, was due to the tendency among those in the Sad Mood (M = -0.33; SD = 1.38), relative to those in the Happy and Neutral groups combined (M = 0.98; SD = 1.23), to report that listening to happy songs would feel inappropriate and wrong, F(1, 166) = 40.55, p < .001. Furthermore, the results of a Sobel test, z = 5.25, p < .001, suggested that these anticipated feelings of inappropriateness
may have at least partially mediated the tendency for participants in the Sad (versus Happy/Neutral) Mood conditions to express aversion to happy music.

Notably, an ANOVA also revealed a main effect of Mood on sad-song appropriateness ratings, $F(2, 166) = 9.19$, $p < .001$. Pairwise comparisons suggested that this was due to participants in the Sad ($M = 0.51; SD = 1.12$), relative to Happy/Neutral ($M = -0.24; SD = 1.17$), groups judging it more appropriate/right for them to listen to sad songs, $F(1, 166) = 15.89$, $p < .001$. However, as detailed above, there was no significant effect of Mood on sad-song preference. Therefore, unlike their judgments of the appropriateness of listening to happy songs, judgments by sad individuals of the appropriateness of listening to sad songs do not appear to have influenced their music preferences.

**General Discussion**

Recent findings regarding the influence of sad mood on music preference have been inconsistent, with at least one prominent study (Knobloch & Zillmann, 2002) suggesting that sadness promotes selective exposure to happy music and others (e.g., Friedman et al., 2012) suggesting much the opposite. In two experiments, we investigated whether this discrepancy may have resulted from differences in the extent to which sadness was induced by having participants think about personally-relevant versus -irrelevant negative events. To this end, we manipulated sad mood via a guided visualization technique in which participants were led to imagine experiencing a profound loss that was relevant either to their own or to an unfamiliar individual’s concerns. Results revealed that irrespective of the self-relevance of the emotion-triggering event, individuals in sad, relative to happy or neutral, moods preferred to avoid listening to exp

### Table 2: Descriptive statistics for measured variables indexed by mood (Experiment 2).

<table>
<thead>
<tr>
<th>Measure</th>
<th>Sad</th>
<th>Neutral</th>
<th>Happy</th>
<th>Sad</th>
<th>Neutral</th>
<th>Happy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.03</td>
<td>1.75</td>
<td>4.90</td>
<td>1.95</td>
<td>5.37</td>
<td>4.65</td>
</tr>
<tr>
<td>2</td>
<td>4.13</td>
<td>1.88</td>
<td>4.84</td>
<td>1.56</td>
<td>4.94</td>
<td>3.21</td>
</tr>
<tr>
<td>3</td>
<td>4.47</td>
<td>1.71</td>
<td>3.72</td>
<td>1.57</td>
<td>3.64</td>
<td>3.88</td>
</tr>
<tr>
<td>4</td>
<td>0.82</td>
<td>1.23</td>
<td>1.34</td>
<td>0.91</td>
<td>1.69</td>
<td>1.01</td>
</tr>
<tr>
<td>5</td>
<td>-0.12</td>
<td>1.28</td>
<td>-0.14</td>
<td>1.12</td>
<td>-0.51</td>
<td>1.13</td>
</tr>
<tr>
<td>6</td>
<td>-0.19</td>
<td>1.37</td>
<td>0.83</td>
<td>1.14</td>
<td>0.90</td>
<td>1.37</td>
</tr>
<tr>
<td>7</td>
<td>0.48</td>
<td>1.34</td>
<td>0.02</td>
<td>1.00</td>
<td>-0.28</td>
<td>1.28</td>
</tr>
<tr>
<td>8</td>
<td>1.27</td>
<td>0.45</td>
<td>1.21</td>
<td>0.41</td>
<td>1.14</td>
<td>0.43</td>
</tr>
<tr>
<td>9</td>
<td>2.97</td>
<td>0.93</td>
<td>4.24</td>
<td>0.87</td>
<td>4.83</td>
<td>1.04</td>
</tr>
</tbody>
</table>

*Note. 1 = How much do you feel like listening to music right now?; 2 = Desire to Listen to Happy Songs; 3 = Desire to Listen to Sad Songs; 4 = How would listening to [happy songs] make you feel right now?; 5 = How would listening to [sad songs] make you feel right now?; 6 = Appropriateness of Listening to Happy Songs; 7 = Appropriateness of Listening to Sad Songs; 8 = Manipulation Check (Visualization); 9 = Manipulation Check (Mood)*
are several possibilities due in large part to the many differences between the mood inductions used in the two studies (see also Friedman et al., 2012). Again, whereas Knobloch and Zillmann (2002) induced negative mood via bogus failure feedback on a test of an important personality trait, we induced sad feelings by having participants imagine extremely tragic, albeit entirely fictitious, events. One critical distinction between the negative affective states elicited by actual versus imaginary events is that only the former have self-regulatory implications. To elaborate, in the face of a real adverse event such as failing a test, individuals must react to it in some way as it potentially bears upon future decisions and actions. They may accept it and attempt to cope with its negative implications or, perhaps more likely, deny its validity and distract themselves from these implications so as to protect their self-esteem. Participants in Knobloch and Zillmann’s (2002) study may very well have used selective exposure to happy music as a means of coping with or distracting themselves from the ostensibly genuine setback they encountered. In contrast, given that the fictional events used to elicit sadness in our experiments did not have any bearing on real-world actions or decisions, participants may have been less concerned with mood management, allowing other motivational factors (e.g., feelings of appropriateness) to play a more prominent role in their music preferences. To explore this possibility, additional research will be required comparing the impact of real versus imaginary sadness-eliciting events within the same experimental design.

Unlike the failure feedback-based sadness induction employed by Knobloch and Zillmann (2002), the sadness inductions used at present also quite clearly involved thinking about social loss. Oliver (2008) has proposed that preferences for expressively sad media may be selectively heightened in states of sadness associated with close relationships (e.g., loneliness, romantic disappointment or loss), as such states elicit a motivation to “contemplate the poignancies of human life” (Oliver, 2008; p. 40) which may be fulfilled via consumption of dramatic entertainment, including sad songs (see also, Greenwood, 2010). Consistent with this notion, Gray, Ishii, and Ambady (2011) recently found that sad individuals were more attentive to vocal tone—a nonverbal cue posited to offer particularly diagnostic information regarding social acceptance versus rejection—only when their sadness was instigated by imagining a social loss, not a setback in achieving an important goal.

In conclusion, our results converge with those of Friedman et al. (2012) to empirically confirm a tendency for sad individuals to avoid happy music. Moreover, we newly demonstrate that this aversion remains undiminished when the sadness is evoked by self-relevant cognitions. Notably, whereas our results are inconsistent with the notion that sad mood engenders mood repair via selective exposure to expressively happy music, we do find that sad individuals are motivated to listen to music that conveys hope or optimism. Again, although such music may express little happiness, it may nonetheless benefit long-term, if not immediate, mood improvement by dint of its positive message and ability to serve as a virtual companion (Lippman & Greenwood, 2010). If so, sad individuals’ ostensibly counter-hedonic music preferences may in fact accord with an underlying hedonic motive, although this motive may be pursued in a manner distinct from that originally proposed by mood management theorists (Knobloch & Zillmann, 2002; Zillmann, 1988).

References


Perspective Involves Understanding of Direction From a Point, Not Just Visual Projection to a Point

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Abstract

Twelve blind participants were presented with side and top views within the same drawings of 4 tables. They were shown as drawn from the front left and front right. 9/12, judged the polar perspective table drawn from the left side as having been drawn from the left side. 10/12, judged the polar perspective table drawn from the right side as having been drawn from the right side. 11/12, judged the polar perspective table drawn from the left side as having been drawn from the left side, even with the cubes resting on the table. 11/12, judged the polar perspective table drawn from the right side as having been drawn from the right side, even with cubes resting on the table.

Keywords: Perspective; Projection; Haptic Pictures; Blind.

Introduction

The ongoing underlying hypothesis that has given impetus to a substantial portion of the Kennedy Research program on haptic pictures since, 1972 is that: “…pictures conform to a universal human capacity not restricted to those who have been taught the code but available, at least in a rudimentary way, even to those who have never had the opportunity to exercise it (Kennedy, 1974; Kennedy & Ross, 1975). The hypothesis, then, is that the corners and edges depicted in sketches for the eye to examine are seen because of an untutored visual aptitude. Haptic pictures for the hand to examine may lead blind persons to identify the same kinds of layout features without the intervention of a teacher to teach them the possible reference for the elements in the sketch” (Kennedy, 1982).

This hypothesis has generated much research which has supported its claims. For example, research has shown that blind adults ranked types of perspective cube drawings in an order consistent with the vantage point description or non-vantage point description of a matching drawing. Specifically, blind people were asked to assume no understanding of a vantage point drawing system, on the part of the person making the drawing, by showing them a drawing of a star table and giving them a description that discussed the symmetry of the star table (see Figure 1).

Blind adults ranked 4 types of perspective cube drawings accordingly, stressing the absence of vantage point in the order of their rankings (see Figure 2).

In another condition, the same blind people were asked to assume an understanding of a vantage point drawing system, on the part of the person making the drawings, by showing them the drawing of a star table and giving them a description that discussed the fact that the table was drawn from underneath (see Figure 1).

When asked to assume an understanding of a vantage point drawing system, on the part of the person making the drawings, blind adults also ranked the same four types of perspective cube drawings accordingly, paying attention to the differences in the perspective systems specified in the drawings, to guide their rankings (see Figure 3).

Thus, the four types of perspective cube drawings are ranked differently by the blind, depending on the testing condition, and they are ranked in the same way in each testing condition (Gabias, 1988; Kennedy, Gabias and Nichols, 1991). The present research extends explorations in blind people’s understanding of vantage point in drawings, with respect to polar perspective.

Method

Participants

Twelve blind participants took part in this study. Eight were recruited from the 2013 National Federation of the Blind Annual Convention in Orlando Florida, and four were recruited from the Canadian Federation of the Blind membership in Victoria B.C Canada. There were 7 males from ages 7 to 62, with a mean age of 35. There were 5 females from ages 15 to 61, with a mean age of 40.

9 subjects were classified as early blind subjects, and the other 3 subjects were classified as late blind. For the early blind subjects, 2 were totally blind from birth, 1 was partially blind from birth and became totally blind at 6 years old, 1 was born blind and has light perception in the left eye, 1 was born blind through Optic Nerve Hypoplasia and has weakening object detection in the left eye, 1 was totally blind by the age of 8 with a gradual loss of residual vision as a legally blind person from birth, 1 was totally blind at the age of 16 with a gradual loss of residual vision as a legally blind person from birth, 1 was blind at 6 years old with only slight light perception remaining, 1 was born blind and has shapes and shadows/light perception.

For the late blind subjects, 1 was totally blind in the left eye by the age of 12 and the right eye by the age of 17, 1 was totally blind at 7 and a half years old as a result of an explosion and was totally sighted before, and 1 was totally
blind by 32 years old through Retinitis Pigmentosa. Only one subject reported to have had previous exposure to haptic pictures, while the other 11 subjects reported that their experience was non-existent.

Stimulus Displays
Participants were presented with 16 raised line drawing stimulus displays (see Figure 1, and Figures 4-16). They also had the opportunity to examine a wooden cube. With one face being 13.5 cm in length. Black and white displays were first produced on a computer monitor, using the shapes option in the Microsoft Word program, using a PC with Windows 7. The displays were then printed onto capsule paper designed for relief reproduction by the Matsumoto Stereo-Copying System. The Matsumoto Stereo-Copying System is a machine that raises black lines contained in black and white stimulus displays through a heating process. It is available from Matsumoto Yushi-Seiyaku Co., Ltd at 1-3, Shibukawa-cho 2-chome, Yao-shi Osaka, Japan. Tel: 81 729 91 1001, web: http://www.mtmtys.com.

Each stimulus display was produced on an 8.5/11 inch sheet of capsule paper. The displays were presented to the participants with the longer side of the sheet of paper horizontal, as in the landscape orientation. Each drawing or pair of drawings was centered on a sheet of capsule paper. Then each sheet of capsule paper was presented individually. For the specific dimensions of the stimulus displays see the Appendix.

Procedure
The blind aren’t normally aware of dealing with polar perspective, in everyday life, but they can discover its principles with focused experience with it. Twelve Blind participants were presented with side and top views, within the same drawings, of four different tables. Two drawings of the tables had cubes shown to be resting on top of them. The drawings were shown as drawn from the front left vantage point and the front right vantage point respectively (see Figures 4, 5, 6 and 7).

The prediction was that with suitable exposures to a sequence of drawings building up their experience with various non-vantage point and vantage point systems, blind participants would judge the polar perspective table drawn from the left side as having been drawn from the left side and, and the polar perspective table drawn from the right side as having been drawn from the right side, with or without polar perspective cubes resting on-top of the tables. The sequence of drawings shown to blind people prior to the polar perspective judgement tasks is shown in the following sequence of Figures: Figure 8, followed by Figure 1, followed by Figures 9-16.

On each presentation of each table (see Figures 8, 1, and 9), the twelve blind subjects were asked to identify the top or side of the tables, as appropriate, depending on the actual figure shown. They were also asked to identify the legs of the tables, distinguishing the front from the back legs where appropriate. For the side view tables, the participants were asked to identify the thicker of the two tables, and then the thinner of the two tables.

For all the cube drawings (see Figures 10-16), the subjects were asked to identify the faces of the cubes and their location.

Results
After the sequence of drawings in figures 1 and 8-16 were shown to the blind participants, the blind subjects were able to make correct direction judgments in perspective table drawings, on the spot (see Figures 4, 5, 6 and 7).

9/12 of the blind participants judged the polar perspective table drawn from the left side as having been drawn from the left side, without the polar perspective cubes resting on the table, p = .0537. 10/12 of the blind participants judged the polar perspective table drawn from the right side as having been drawn from the right side, without the polar perspective cubes resting on the table, p = .0161. 11/12 of the blind participants judged the polar perspective table drawn from the left side as having been drawn from the left side, with the polar perspective cubes resting on the table, p = .0029. 11/12 of the blind participants judged the polar perspective table drawn from the right side as having been drawn from the right side, with the polar perspective cubes resting on the table, p = .0029. Binomial tests show these results to be significant at or < .05 depending on the testing condition.

These results suggest that, for blind people, perspective can involve an understanding of direction from a point, not just an understanding of visual projection to a point.

Discussion
These results are impressive given that according to Kennedy (1982), “… even Gibson recoiled when considering haptic pictures, and he predicted that they would fail to be meaningful to the blind.” Kennedy (1982) explains that, for Gibson (1986), “…pictures have to capitalize on the laws of optic information”. According to Kennedy (1982), “Even if optic information is being used by a pictorial display, it may not be entirely foreign to haptics. There is some common ground between haptic and optic information. Notably, the geometry of direction is identical, whether it is being dealt with by touch or vision. Pointing is useful for both blind and sighted people. Both point to objects and locations, showing that they understand directions. Many of the important principles of optic information can be considered in terms of direction. A receding object projects a narrower cone of light because of the change in direction of its periphery from the point of observation. The shape transformation of a rotating disc, projecting first a circular cone, then an ellipse, and finally a line, can be described as a set of changes in direction of its periphery from the point of observation. The optic principles of form and space from a fixed point of observation, including perspective transformations with change of distance and rotation, are present in haptics as principles of direction. The principles apply to pointing outward as readily as they do to rays traveling inward. Hence, there may be a basis for a blind person to understand
some haptic pictures that conform to optic information.” According to our latest results, there is in fact evidence to suggest that blind people understand some haptic pictures that conform to optic information.

Our findings have practical implications as well. At the annual conference of the National Organization of Parents of Blind Children (NOPBC), held at the National Federation of the Blind’s (NFB) 2013 annual convention, Maneki (2013) gave a presentation entitled, “The Dawn of the Age of Tactile Fluency: Let the Revolution Begin!” He wrote, “Up to now, parents of every blind child have inevitably run up against this vexing problem: ‘My blind child will be taking geometry next year. How will we handle all of those drawings?’” … “It is beginning to be understood that just as Braille is best mastered if it is taught at an early age, we must also begin teaching graphic skills to blind children at an early age.” Given our research results and the research results of Kennedy and his colleagues, which suggest that blind people can innately understand that lines can stand for edges of surfaces and patterns of lines can stand for faces of surfaces, the teaching of graphic skills, referred to by Maneki, may simply involve teaching the use of technologies that can create raised lines for blind people. According to Maneki (2013) “Tactile-graphics technology has advanced to the point where we can produce satisfactory diagrams with embossing devices and incorporate these diagrams into Braille textbooks.” However, in order for drawings to be effective for blind people they must conform to the perceptual and cognitive demands required by the haptic system. Progressive exposures from simple to complex and suitable descriptive figure captions may be required for blind people to make full use of haptic pictures. Also, practice at drawing is very important. Miller (1991) suggests that “… output factors are crucial in coding shape by touch. What I am proposing is that haptic representation is based on action plans.” Miller found that “Congenitally totally blind children produced reasonable drawings of the human figure more easily than they recognized such drawings.” Unfortunately, drawing equipment for blind people is generally not made available. Maneki states that the Sewell Raised Line Drawing Kit, the APH Draftsman, and other devices exist. “However, the potential to teach blind people to sketch on these boards or to use them as a medium of self-expression has been given minimal emphasis. Furthermore, there has never been an effective way to perform erasures and make changes to tactile sketches.” E.A.S.Y LLC is a company that produces a sleek battery-powered thermal eraser. It also has the beginnings “of an entire line of products that allow for the creation, editing, reproduction, and digital transmission of raised-line drawings.” Maneki writes that at the 2013 NFB convention in Orlando, the company demonstrated how easy it was to use their drawing board and how effortlessly blind persons of all ages could construct many images, some simple and others more complex. Again, these capacities of blind people of all ages to produce drawings that have meaning to them lend support to Kennedy’s (1974, 1982) original hypothesis that: Haptic pictures for the hand to examine, may lead blind persons to identify the corners and edges of surfaces without the intervention of a teacher, to teach them the possible reference for the elements in the sketch. The issue of polar perspective for the blind has always been a puzzle for many blind and sighted people. According to Kennedy (1982) some of the highly educated and articulate blind people at the Louisville Workshop on tactual graphics in 1979, “…argued that the pictorial material was bound to fail whatever style was used because, they said, concepts such as point of view and overlap would not be understood by most blind readers”. Our results with our blind participants stand in stark contrast to that opinion.

One might ask why educated blind adults would believe that concepts such as overlap and point of view would not be understood by most blind readers. Jernigan (1965) offers a possible explanation. Public attitudes about the blind too often become the attitudes of the blind. The blind are part of the general public. They tend to see themselves as others see them. They too often accept the public view of their limitations and thus do much to make those limitations a reality. There is probably not a single blind person in the world today (present company included) who has not sold himself short at one time or another.

At one time in my life I ran a furniture shop, making and selling the furniture myself. I designed and put together plans. Furthermore, there has never been an effective way to perform erasures and make changes to tactile sketches. Miller found that “Congenitally totally blind children produced reasonable drawings of the human figure more easily than they recognized such drawings.” Unfortunately, drawing equipment for blind people is generally not made available. Maneki states that the Sewell Raised Line Drawing Kit, the APH Draftsman, and other devices exist. “However, the potential to teach blind people to sketch on these boards or to use them as a medium of self-expression has been given minimal emphasis. Furthermore, there has never been an effective way to perform erasures and make changes to tactile sketches.” E.A.S.Y LLC is a company that produces a sleek battery-powered thermal eraser. It also has the beginnings “of an entire line of products that allow for the creation, editing, reproduction, and digital transmission of raised-line drawings.” Maneki writes that at the 2013 NFB convention in Orlando, the company demonstrated how easy it was to use their drawing board and how effortlessly blind persons of all ages could construct many images, some simple and others more complex. Again, these capacities of blind people of all ages to produce drawings that have meaning to them lend support to Kennedy’s (1974, 1982) original hypothesis that: Haptic pictures for the hand to examine, may lead blind persons to identify the corners and edges of surfaces without the intervention of a teacher, to teach them the possible reference for the elements in the sketch. The issue of polar perspective for the blind has always been a puzzle for many blind and sighted people. According to Kennedy (1982) some of the highly educated and articulate blind people at the Louisville Workshop on tactual graphics in 1979, “…argued that the pictorial material was bound to fail whatever style was used because, they said, concepts such as point of view and overlap would not be understood by most blind readers”. Our results with our blind participants stand in stark contrast to that opinion.

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So, I would say that, based on our results, imagination and exposure are the key to success in the perception, comprehension and production of haptic pictures for and by blind people.

As Helen Keller once said: “The only thing worse than being blind is having sight but no vision” (Retrieved from http://www.helenkelleronline.com/).

References


Appendix

Dimensions of Stimulus Displays

Figure 1: The stimulus display in Figure 1 consisted of a raised line drawing of a square with four diagonal lines protruding from each corner of the square. Each side of the square was 4.3 cm in length. The length of each protruding line was 2.9 cm in length.

Figure 4: The stimulus display in figure 4 consisted of a raised line drawing of a perspective table, drawn from the top, front, left vantage point. The front face of the table consisted of two parallel lines converging at the right side of the table. The space between the two parallel lines forming the top and bottom edges of the front face, on the left side, of the table was .5 cm in height. The space between the two parallel lines forming the top and bottom edges of the front face, of the right side of the table was .2 cm in height. The front face of the table was 19.1 cm in length. The back edge of the table was 19.1 cm in length. The length of the left face of the table, from front to back, was 5.6 cm. The length of the right edge of the table, from front to back, was 4.0 cm. Each face of the legs of the table was represented by two vertical parallel lines. The space between the two parallel lines representing the left legs of the table was .25 cm. The space between the two parallel lines representing the right legs of the table was .24 cm. The vertical lines representing the left front leg of the table were 6.7 cm in length, representing the height of the left front leg of the table. The vertical lines representing the right front leg of the table were 5.0 cm in length, representing the height of the right front leg of the table. The vertical lines representing the left back leg of the table were 6.3 cm in length, representing the height of the left back leg of the table. The vertical lines representing the right back leg of the table were .8 cm in length, representing the height of the right back leg of the table. The lines representing the front legs join the table’s front edge at each end of the table. The lines representing the back left leg join the table’s back edge at the left hand side of the table. The lines representing the back right leg of the table join the front side of the table. The horizontal distance between the lines representing the front right leg and the back right leg was 2.1 cm in length. The reason this distance was chosen was because with that distance between the front and back right legs, the lines representing the back leg align perfectly with the back right corner of the top of the table, if the lines representing the back right leg were to be extended across the top of the table.

Figure 5: The stimulus display in Figure 5 consisted of a raised line drawing of a perspective table, drawn from the top, front, right vantage point. The dimensions in Figure 5 replicated the exact specifications used in Figure 4, except that the dimensions were horizontally reversed to produce a perspective table, drawn from the top, front, right vantage point.

Figure 6: The stimulus display in Figure 6 consisted of a raised line drawing of a perspective table, drawn from the top, front, left vantage point, with cubes resting on-top of the table. Figure 4 specifications were replicated in Figure 6. Figure 6 also consisted of three drawings of a cube each showing the front, the top, and the left hand faces of the cubes. For each cube, the front face was a square-ish shape and the top and left sides of the cube were shaped as parallelograms. The vertical line representing the front right edge of each cube is slightly shorter than the line representing the front left edge of each cube. The largest cube is resting on top of the table, the bottom front edge of the square is .1 cm above the front face of the table, and the line representing the bottom left edge of the cube along the z-axis is .2 cm to the right of the left face of the table. For the largest cube on the left side of the table, the left vertical line of the square representing the left front face of the cube was 1.9 cm in length. The right side of the square was 1.7 cm in length. The top and bottom horizontal lines of the square were 2.3 cm in length. The left parallelogram representing the left face of the largest cube had a bottom oblique line that
was .9 cm in length. The top oblique line was .8 cm in length. The right vertical line of the parallelogram was .9 cm in length. The left vertical line of the parallelogram was 2.0 cm in length. The parallelogram representing the top face of the largest cube had left and right oblique lines that were .8 cm in length. The top and bottom horizontal lines of the parallelogram were 2.3 cm in length.

The second largest cube was resting on top of the table, with its front face at the horizontal and vertical centre of the top surface of the table. The left corner of the bottom front edge of the cube was 1.7 cm from the top front edge of the table. The right corner of the bottom front edge of the cube was 1.6 cm from the top front edge of the table. For the second largest cube at the centre of the table, the left line of the square representing the left side of the front face of the cube, was 1.7 cm in length. The right side of the square was 1.6 cm in length. The top and bottom horizontal lines of the square were 1.6 cm in length. The left parallelogram representing the left side of the second largest cube, had top and bottom oblique lines that were each .6 cm in length. The right vertical line of the parallelogram was 1.7 cm in length. The top oblique line of the parallelogram was 1.3 cm in length. The left parallelogram representing the top face of the second largest cube, had top and bottom oblique lines that were each .6 cm in length. The top and bottom horizontal lines of the parallelogram were each 1.6 cm in length.

The smallest cube was resting on top of the table, the bottom left corner of the square was .55 cm below the back top edge of the table, and the bottom right corner of the square was .1 cm to the left of the right edge of the table. The back top edge of the table actually ends at the left face of the cube. For the smallest cube on the right side of the table, the left line of the square representing the left side of the front face of the cube, was .9 cm in length. The right side of the square was .8 cm in length. The top and bottom horizontal lines of the square were 1.0 cm in length. The left parallelogram representing the left side of the smallest cube, had a top oblique line that was .4 cm in length. The bottom oblique line was .3 cm in length. The right and left vertical lines of the parallelogram were each .9 cm in length. The top parallelogram representing the top face of the smallest cube, had right and left oblique lines that were each .4 cm in length. The top horizontal line of the parallelogram was .9 cm in length. The bottom horizontal line of the parallelogram was 1.0 cm in length.

**Figure 7:** The stimulus display in Figure 7 consisted of a raised line drawing of a perspective table, drawn from the top, front, right vantage point, with cubes resting on-top of the table. The dimensions in Figure 7 replicated the exact specifications used in Figure 6, except that the dimensions were horizontally reversed to produce a perspective table, drawn from the top, front, right vantage point with cubes resting on-top of the table.
Figure 5: Perspective table drawn from the top, front, right vantage point.

Figure 6: Perspective table drawn from the top, front, left vantage point, with cubes being shown as resting on the table.

Figure 7: Perspective table drawn from the top, front, right vantage point, with cubes being shown as resting on the table.

Figure 8: Square Table drawing.

Figure 9: Side View of Table drawings, one with a thick side and another with a thin side.

Figure 10: Foldout Cube drawing.

Figure 11: Two Squares Cube drawing.

Figure 12: Square and Rectangle Cube drawing.

Figure 13: Y-Junction Cube Perspective drawing.
Figure 14: Y-Junction Cube Perspective drawing, resting on one corner.

Figure 15: drawing with Top, Front and Right Faces of Cube.

Figure 16: drawing with Top, Front and Left Faces of Cube.
An Introduction to Aesthetic Precognition

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Abstract
The paper presents some results of an experiment conducted in an innovative way through the use of the most popular social network: Facebook. Exploiting the system of “like” and “share” on which this platform is based, thousands of artwork images were submitted to a sample of over 10,000 users worldwide. Through the metrics analysis of users choices, it was observed that specific compositional elements inside the artworks are able to drive the aesthetic preferences of the viewers towards some artworks rather than others. The knowledge of the “responsive” items, that activate the Beauty recognition, allows to predict the possible aesthetic choices of the public. We have defined this phenomenon as Aesthetic Precognition.

Keywords: Art; Perception; Aesthetics; Neuroesthetics.

Introduction
Is it possible to identify the compositional elements of an artwork, that are able to activate the brain areas responsible for the Beauty recognition and induction of the Aesthetic Pleasure in the viewers? It may be that all of us are driven by a specific form of aesthetic determinism when we admire and appreciate an artwork? If we were able to predict the aesthetic preferences of the public towards an artwork, maybe could we talk about Aesthetic Precognition?

Some positive feedbacks have came by analyzing the aesthetic choices of the public towards several artwork images posted on Facebook. In fact, this paper announces in advance some results of an empirical study – still in progress – that we are conducting in an unconventional way through the use of the most popular social network, in order to explore a new investigation field based on the intersection among Psychology of Perception, Neuroaesthetics and Information Technology.

Method
To get our reference sample, we have opened three identical personal profiles on Facebook, on which we have posted - every day for three years - several images of contemporary artworks, specifically in the forms of sculptures and installations, created through many different artistic techniques by artists from around the world.

The sample we have analyzed was constituted by the contacts aggregated to each profile, which have been divided into two clusters on the basis of their competence in art: naïve viewers (namely: not art expert) and art professionals (namely: artists, curators, critics, gallerists), both of them coming from around the world. In the course of three years thousands of images have been posted, and two of these profiles have reached the limit of 5,000 contacts imposed by social network, due to the large number of friends requests, attracted by the artwork images. Therefore our research has focused on a sample consisting of over 10,000 users worldwide (unaware of being involved in the experiment), to whom over 15,000 artwork images have been submitted with the aim to evaluate the aesthetic preferences, expressed by the viewers through the “like” and “share” system, typical of Facebook. We have carefully evaluated metrics, analytics and folksonomies provided by the social network regarding to the aesthetic preferences of the viewers, that is the quantitative data obtained in terms of “like” and “share”, as well as the user engagement percentages achieved by each artwork, which expresses rather accurately the aesthetic orientation of the viewers, analyzing and segmenting the artwork characteristics, and identifying the occurrences of specific compositional elements compared to the aesthetic preference peaks determined by the choices of the public.

The experiment has confirmed that the perceivers, with no significant differences between the two clusters of viewer (art insider or non-insider) and their nationality, are somehow attracted by the same type of images and by the same combinations of compositional elements (shapes, colors, spatial layout, etc.), reacting the same way to the same aesthetic stimuli, so that when we have proposed afterwards other different artworks in accordance with the aesthetic choices previously given by the viewers, it has been possible to predict rather accurately what would have been their possible aesthetic preferences towards the artworks before these were shown.

Although there was no contextualization of the artworks inside a three-dimensional exhibition space, as an art gallery or a museum – in fact through the computer screen the artwork images are shown in bidimensional mode (similar to live viewing of a painting) - the experiment has given back anyway a rather accurate idea of what are the “responsive” compositional elements inside the artwork able to activate the aesthetic pleasure in the perceiver, unlike the fMRI (Functional Magnetic Resonance Imaging), which has allowed to describe until now only the brain modifications and identify the cerebral areas connected to the aesthetic pleasure under the influence of specific visual stimuli (Di Dio, Macaluso, & Rizzolatti, 2007), regardless of the identification of aesthetically “responsive” elements within the artwork, that can activate the perception of Beauty, inducing a specific aesthetic behaviour from the public. Indeed, it has been possible to isolate some well-defined categories of compositional elements inside the artworks that, if combined in a precise way, could activate the Beauty recognition and direct the preferences of perceivers towards...
the artistic objects that meet such compositional characteristics, so that during the experiment we have been able to predict with reasonable accuracy which artworks the public would have preferred. In fact, thousands of artwork images having those identified compositional characteristics have been subsequently reproposed several times and the preferences of the viewers have been exactly what we expected, confirming that those compositional items were able to control the activation of Aesthetic Pleasure, stimulating or exciting the brain areas connected to the Beauty recognition, influencing thereby the aesthetic choices of the viewers and inducing specific reactions from the public. As a countercheck, we have proposed several artwork images in which, intentionally, those “responsive” elements were absent: as expected, the percentages of preference towards these artworks have been very low. This has allowed to confirm that certain specific compositional elements inside the artworks play as attractors of the Aesthetic Pleasure enabling the Beauty recognition and the orientation of aesthetic preferences by the perceiver towards an artwork rather than another, bringing about the prediction of a precise aesthetic behavior from the public, contrary to a fully subjective interpretation or judgment about the Beauty and Aesthetic Pleasure (Reber, Schwarz, & Winkielman, 2004).

**Results**

As already noted by the latest research in the field of Neuroaesthetics, “human beings are endowed with species-specific mechanisms that resonate in response to certain parameters present in works of art” (Di Dio et al., 2007): keeping in mind the symbolic and evocative appeal of an artwork, and the conditioning exercised by the subjective aesthetic experience, cultural background, personal values, emotions and by specificity of the individual memories of each perceiver (Reber et al., 2004), that certainly could determine a subjective and changeable judgment about the Beauty, we have observed that Beauty perception was activated more frequently in the presence of specific “responsive” elements inside the artwork, and through our experiment it has been possible to identify such compositional items by means of an accurate data gathering related to their occurrence and frequency within the artworks, and to the preferences and aesthetic choices by the viewers and frequency within the artworks, and to the preferences and aesthetic choices by the viewers.

Some of “responsive” elements capable of activating the Beauty perception and the Aesthetic Pleasure in the viewers, that have been isolated by means of the experiment conducted through Facebook, are:

- the black / white contrast;
- specific shapes and their layout or compositional equilibrium;
- the presence of regular geometries;
- certain combinations of bright colors or, on the contrary, a smooth color gradation and soft tones;
- the interaction, correlation, concordance, simplicity, balance, linearity, symmetry and harmony of the compositional elements inside the artworks;
- the presence of red color;
- the multiplication or repetition of elements identical to themselves;
- the presence of evanescent, evocative or surreal elements;
- the Golden Ratio or sectio aurea, namely the proportion of compositional elements expressed by the value Φ=1:0.618 (Huntley, 1970; Livio, 2002);
- the presence of no more than three visual items or defined groups of figurative elements to be decoded;
- the presence of perfect circles or circular and rounded shapes;
- the miniaturization of the compositional items;
- the specific location of an artwork inside the exhibition space and into the fruition context (such as a gallery, museum, or urban space);
- the importance of light as a function of iconographic grammar and syntax of an artwork;
- the representation of semantic contrasts or paradoxical juxtaposition; a modulated and not too sharp deviation compared to the canonical images of artistic beauty;
- an unexpected deviation from the rules of spatial perspective, reconstructed normally by the viewer through the rules of perceptual constancy (according to Gestalt Psychology);
- the reference to the known forms of reality; the presence of images that recall dynamism and movement.

As recently demonstrated by in-depth investigations conducted through the use of neuroimaging techniques (fMRI), some of the above items are indeed capable of stimulating the right hemisphere and prefrontal cortex of the brain (Cela-Conde et al., 2004; Krügelbach, 2005), but we have observed that such compositional elements are also able to induce precise aesthetic behaviours, conditioning, orienting, directing and driving the aesthetic preferences of the viewers towards certain artworks rather than another, activating the Beauty recognition and the Aesthetic Pleasure of the public. We believe even that, if such elements were found all together in a specific display context, in the presence of particularly susceptible individuals, they could be able to cause a perceptive shock or aesthetic breakdown in the perceiver, known as Stendhal syndrome (Magherini, 1989; Nicholson, Pariante, & McLaughlin, 2009).

As argued by E. H. Gombrich (1984), the factors that determine the aesthetic experience are inherent in our biological inheritance, even if we are not able to give them a conscious explanation. Towards specific visual stimuli, the aesthetic judgment seems to activate and “resonate” in the
same way inside all the perceivers worldwide (Csikszentmihalyi, 1988): it’s like if the viewer, admiring an artwork having those specific characteristics, discovered something already known, a kind of immanent principle of Beauty: C. G. Jung called this principle as Archetype (1969). In fact, we have detected the same typology of aesthetic preferences by most viewers of both analyzed clusters (expert or non-expert in art) exposed to the submitted artwork images: the systematic and steady repetition of the same aesthetic choices towards certain artwork groups has shown that there are some specific compositional elements inside the artworks able to activate the Perception and Aesthetic Pleasure in the perceivers.

The responses of the viewers towards the above compositional elements have appeared to be similar for each individual, so that it has become possible to predict the following preferences from the public towards not yet submitted artworks. We have defined this phenomenon as Aesthetic Precognition, that is the possibility to predict in advance the aesthetic choices of a viewer towards an artwork group before this has been shown, or, for those individuals who have learned to recognize the “responsive” compositional elements inside the artworks, that specific ability to identify beforehand the structures of the artwork’s Beauty: in fact, the knowledge of these “responsive” structures would make possible to foreknow what might be the aesthetic choices of a viewer towards an artwork.

The Aesthetic Precognition has nothing paranormal or esoteric, because it is connected to neurophysiological and biochemical brain mechanisms and to human perception dynamics, according to which the humans realize the concept of Beauty, that would be only apparently subjective, and feel attracted or fascinated by a given artwork rather than another (Valentine, 1962). Probably the Beauty concept, that form and organize the human perceptual experience towards the artworks, is biologically and genetically predetermined, as if it had been inscribed by ever in the human DNA (Dutton, 2009). In fact, the Aesthetic Precognition is basically a specific form of aesthetic determinism or perceptual conditioning, through which the preference of an individual towards an artwork might be predicted or predetermined: according to this perspective, it would be then possible to know in advance whether a given artwork might like or not to the viewers, or realize artworks able to induce the Aesthetic Pleasure in order to condition the aesthetic perception of the public. Aesthetic Pleasure (Reber, Schwarz, & Winkielman, 2004).

Conclusions

For centuries man has questioned about the Beauty concept and its nature, but it is possible that such Beauty is based on the brain neural structures, that nowadays can be explored and analyzed in depth (Kawabata & Zeki, 2004; Jacobsen, Schubots, Hofel, & Cramon, 2006): if Neuroesthetics has made possible to identify - through the neuroimaging technologies such as the fMRI - the brain areas activated during the viewing of an artwork (Zeki, 1999), the research we are still carrying out is allowing to track and identify the path of Beauty perception and the “responsive” compositional elements that can stimulate the emergence of Aesthetic Pleasure in the perceivers. This perceptual process has been highlighted by the steadily repeated aesthetic choices of the viewers towards the artworks submitted during the experiment, that are certainly connected to the psychobiological mechanisms of human perception (Berlyne, 1971; Vartanian & Goel, 2004; Martindale, 2007).

Thanks to the study of those “responsive” compositional elements inside the artworks, the analysis of aesthetic behaviour implemented by the viewers, and the support of Neuroesthetics, which analyzes the neural mechanisms involved in the aesthetic perception, we could succeed to develop an Aesthetic Algorithm able to predict fairly accurately the aesthetic choices and preferences of the public towards the artworks, before they are disclosed by the perceivers. According to this algorithm, an artist would even be capable of modulating the share of Beauty to be included within the artwork, in order to induce specific reactions and emotions in the viewers (Freedberg & Gallese, 2007), acting on the basis of a Predictive Aesthetics: a sort of subliminal, planned and premeditated aesthetic conditioning, able to influence, orientate, direct and drive the aesthetic preferences from the public. The predictive analysis of the artwork’s Beauty, based on knowledge of the compositional elements able to stimulate the Beauty perception and activate the Aesthetic Pleasure in the public, could allow the artists to operate according to the Aesthetic Precognition, to such an extent to modify their artistic creativity in order to influence the aesthetic choices of the viewers.

The spontaneous creativity of the artist, prompt expression of natural emotions, could turn into a intentional ability to catch in a premeditated way the aesthetic preferences of the public, activating the desired reactions from the viewers: the artist’s creative work could turn into aesthetic predetermination, creating pieces of art predestined to be beautiful. Indeed, founding a predictive aesthetics can be someway dangerous: the possibility of making a deliberate and artificial construction of the Beauty, and the ability to attract and condition successfully the aesthetic preferences and choices from the public, based on the foreknowledge of “responsive” compositional elements inside the artworks, responsible for the activation of Aesthetic Pleasure, could become a new artistry or an effective technique learned by the artist to influence the aesthetic judgment of the viewers, inducing an aesthetic premeditation able to inhibit and influence the creative freedom, bringing about a leveling and standardization of the artistic production on a steady beauty, a sort of white noise that can stifle the spontaneous expression of the artistic creativity. In fact, the creative inspiration and impetus by the artist could be affected and conditioned beforehand: through the foreknowledge of the brain activation mechanisms of Aesthetic Pleasure, the artist could become the creator of a conscious, intentional and premeditated aesthetics, subtracting the artwork from its status of autonomous set of meanings, susceptible to
subjective interpretation by each individual (Freedberg & Gallese, 2007). The Aesthetic Precognition is certainly an interesting research perspective from a scientific point of view, because it is situated at the intersection between Experimental Psychology and Empirical Aesthetics, but this new search field could upset the dynamics of value assignment to the artworks, giving more importance to the aesthetic judgement of the public, influenced in premeditated way by the artist through the Aesthetic Precognition, rather than to the art experts, and revolutionizing eventually the Art Market. In fact, the possibility of establishing a Precognitive Aesthetics could be dangerous for the current Art System: the predictive formula of the artwork’s Beauty could influence not only the aesthetic judgment of the public, but also the same creative artist’s work. The artist’s talent could be built on the precognition of the aesthetic preferences of the public: thanks to the knowledge of the compositional elements able to influence the activation mechanisms of Aesthetic Pleasure, an artist could be capable of creating ever-beautiful artworks to satisfy and gratify the aesthetic tastes of the public all the time (Berlyne, 1974). The Aesthetic Precognition might therefore influence the creative freedom, inducing the artist to create artworks according to these predictive criteria.

Through the Aesthetic Precognition an artist could perfectly suit the tastes of the public, predicting, anticipating and predetermining the aesthetic choices of the viewers, with the aim of achieving the universal and absolute Beauty. This Beauty-centric process of attribution of the artwork’s value may be able to create a different market value for the artworks, or even change the value assigned so far. In fact, the creation of a new market value for an artwork, based on its real Beauty, besides modifying the artist’s creative mode, could revolutionize also the current conventional rules of determination of the artwork value, and the evaluation criteria by the art influencers, such as critics, curators, art dealers and gallery owners, who manage the Art Market nowadays. Therefore the Aesthetic Precognition could represent a threat to Creativity, which through the foreknowledge of the techniques of stimulation of the Aesthetic Pleasure might be influenced, conditioned and distorted, making the artist less free and spontaneous, and reducing the Creativity to a mere behavioral marketing operation that aims to capture the public favor, with the result of determining a precise orientation of the artistic creativity. But, on the contrary, Aesthetic Precognition could also represent an opportunity for enrichment of the artistic and creative knowledge. Our investigation is not over yet, but it is only at the beginning: next step will be to identify the Aesthetic Algorithm able to describe in mathematical terms the process of Beauty perception and the activation mechanisms of the Aesthetic Pleasure in the viewers.

References


Empathy and the Aesthetic Experience: How “Einfühlung - Feeling Into” Changes Aesthetic Experiences of Representational and Abstract Art

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Abstract

Dating back to Theodor Lipps it is hypothesized that empathic processes through “Einfühlung – feeling into” are essential to aesthetic experiences. Here we tested how the ability of feeling into emotional aspects changes aesthetic experiences. Participants differing in emotional contagion (EC) – the ability to pick up and mirror emotions – evaluated abstract and representational artworks on several aesthetic dimensions (liking, moving, valence, interest) while their bodily reactions indicative of emotional processes (facial electromyography - EMG, and skin conductance responses - SC) were recorded. High compared to low EC participants showed more intense bodily reactions (EMG, SC) and stronger aesthetic evaluations (moving, valence, interest) when exposed to art. Eventually, they also liked art more. Thus, “Einfühlung” can contribute to more positive aesthetic experiences.

Keywords: aesthetic experience, emotional contagion, facial EMG, empathy

Introduction

Empathy—nowadays psychology mostly referring to having isomorphic feelings to another person, understanding, and identifying the source of these feelings—initially stems from the 19th century concept of “Einfühlung - feeling into” (Lipps, 1903). According to this concept empathic processes are essential for the appreciation of aesthetic objects like architecture, sculptures, and visual art (Freedberg & Gallese, 2007).

Through “Einfühlung” one feels into, that is, one has an embodied and kinaesthetic experience of the form, style, narrative, and emotional content of aesthetic objects. This results in corresponding changes in actual or subtle bodily reactions, emotional and cognitive responses, and eventually a stronger aesthetic experience. Here we tested how the ability of “feeling into” emotional content changes aesthetic experiences by comparing two groups of participants differing in emotional contagion (EC). EC, defined by the tendency to pick up and mirror emotions, can contribute substantially to empathic responses (Singer & Lamm, 2009).

Participants—either high or low in EC (Doherty, 1997)—aesthetically evaluated two different kinds of artworks - representational and abstract - differing along the emotional dimensions of valence - positive, negative - and arousal - high, low (Russell, 1980). To capture changes in the aesthetic experience due to EC participants provided valence, interest, moving, and liking ratings that include emotional and cognitive aspects of the aesthetic experience (Leder, Belke, Oeberst, & Augustin, 2004; Silvia, 2010; Vessel, Starr, & Rubin, 2012). Importantly, we also measured bodily reactions indicative of emotional and mimicry processes by employing facial electromyography (fEMG) and skin conductance (SC) recordings. Whereas fEMG indicates subtle changes in emotional valence—negative valence results in higher M. corrugator supercilii (frowning) and positive valence in stronger M. zygomaticus major (smiling) activation and/or M. corrugator supercilii relaxation—SC reliably captures changes in physiological arousal (Lang, Greenwald, Bradley, & Hamm, 1993).

We assumed that participants with a higher compared to lower EC would report stronger aesthetic experiences (liking, valence, moving, interest) and would show stronger bodily reactions (SC, EMG) when exposed to representational and abstract artworks. Additionally, we hypothesized that this difference would be more pronounced for the representational artworks as these artworks clearly depicted emotional content by showing humans in emotional scenes. For the abstract artworks emotions were rather conveyed by the artworks style (e.g., color, way of painting) but not by content.

Methods and Results

In total 60 participants (42 female) took part in the experiment. These participants were preselected according to their EC score with half of the participants exhibiting a low score (EC < 3.35) and the other half a high score (EC >3.89) which reflects half a standard deviation above and below the mean of the EC scale (Doherty, 1997).

Participants evaluated representational artworks in one block and the abstract artworks in another block while facial EMG and SC responses were recorded. A trial started with a cross-hair (2 seconds) followed by the artwork shown for 6 seconds after which the participants provided their liking, moving, valence and interest ratings. Order of ratings was randomized across participants. Upon finishing this task participants filled in several questionnaires serving as control measures and manipulation checks - an art expertise questionnaire (Leder, Gerger, Brieber, & Schwarz, 2014), a questionnaire on perceived subjective emotion experience and emotion regulation (SEE, Behr & Becker, 2004) and the...
questionnaire of cognitive and affective empathy (Reniers, Corcoran, Drake, Shryane, & Völlm, 2010).

High compared to low EC participants reported to be more empathic (QCAE), to have stronger emotional reactions (SEE), and higher general interest in art (expertise questionnaire). However, high and low EC participants did not differ in terms of emotion regulation, perceived emotion self-control (SEE), or art specific knowledge (expertise questionnaire).

Importantly, EC influenced bodily reactions and evaluations of abstract and representational artworks. Evaluating representational artworks high compared to low EC participants showed stronger bodily reactions—a higher M. corrugator supercilii activation towards negatively-valenced artworks, more M. corrugator supercilii relaxation towards positively-valenced artworks, and higher SC responses particularly for highly arousing negative artworks. This was accompanied by changes in evaluations. High EC participants were moved more by representational art, they reported stronger valence reactions, and they indicated higher interest especially for positively-valenced artworks. Importantly they also liked positively-valenced art more showing that EC can lead to a more positive aesthetic experience.

When evaluating abstract artworks high compared to low EC participants also showed stronger SC reactions, they reported to be moved more by highly arousing negative compared to highly arousing positive artworks, and they showed a tendency to like lowly arousing positive artworks more.

Discussion

These results demonstrate that the ability of “Einfühlung” into emotional aspects of pictures changes aesthetic experiences. It can contribute to intensified and more positive aesthetic experiences. These effects of EC on aesthetic experience were stronger for representational compared to abstract artworks which might be due to the nature of the representational artworks, which more clearly depicted emotional content compared to the abstract artworks. Importantly, these differences emerged due to differences in EC and overall empathy but not due to differences in the ability to regulate emotion or perceived emotional self-control. Thus, in line with ideas dating back to Lipps, “Einfühlung”—in this specific case for the emotional aspects of paintings—is essential for the aesthetic experiences (Freedberg & Gallese, 2007).

References


The Development of Visual Art Preferences

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Abstract
The development of visual art preferences is an understudied area in aesthetics research. Yet, it is necessary to understand how our aesthetic appreciation emerges and what factors influence this process during development. A good framework to study early art appreciation with infants and young children requires an examination of the interactions among different components of aesthetic experience (sensation, knowledge, and emotion). This line of research can help identify general perceptual primitives in visual art preferences and how they diverge across development and culture. This review will propose a model to study early development of art preferences.

Keywords: developmental aesthetics; infants; visual art

How do young children experience art and what guides their preferences for artwork? For adults, both subjective and objective factors interact to drive people’s preferences for visual art (Leder et al., 2004). Shimamura (2012) suggests that aesthetic experience involves three key components: sensation, knowledge, and emotion, and a good framework for experiencing art needs to involve them (Chatterjee, 2013). Aesthetic experiences are also proposed to emerge from the interaction of different neural systems: sensory–motor, emotion–valuation, and meaning–knowledge (Chatterjee & Vartanian, 2014). The key question in developmental aesthetics is how these components and systems interact from early on in a person’s life? One way to approach this question is to examine developmental trajectories of each component and the interactions among them. Infant studies allow us to examine the aesthetic triad in which the meaning-knowledge component is minimized. In adults, the relative contribution of each part of the triad in appreciating artwork is difficult to test. In this review, we will present the current state of the field on young children’s preferences for art and propose a model to study the development of visual art preferences.

Infants’ Visual Attentional Preferences

Research on how very young children experience art and what influences their preferences in artwork is scarce. Yet, mounting evidence from infant studies demonstrates that during the first year of life infants develop the necessary low-level perceptual abilities to perceive visual art. Here, we selectively review the literature on infants’ attentiveness to certain features, colors, faces, and scenes that might guide and inform about their preferences of visual arts.

In the first 6 months after birth, infants have visual acuity (Kellman & Arterberry, 2006), depth perception (Yonas, Elieff, & Arterberry, 2002), and color vision (Suttle et al., 2002) comparable to adults. Sensitivity to red and green is present by 2 months of age (e.g., Dobkins, Anderson & Kelly, 2001), and sensitivity to blue and yellow is found at around 3-4 months of age (Suttle, Banks, & Graf, 2002). However, Taylor and colleagues (2013) showed that infant color preferences might be different than adults. For example, infants do not always prefer the colors that are preferred by adults (e.g., blue hues; but see Zemach, Chang, & Teller, 2007). This suggests that the preferences toward certain color hues might not be innate, or of innate continue to evolve in early development. For colors such as red, the findings are mixed. While most studies suggest that infants have a looking preference for red (Franklin et al., 2010), some research suggests this preference is not strong (Zemach et al., 2007).

Moreover, infants are sensitive to pictorial cues such as texture gradients, line junctions, and shading (e.g., Bertin & Bhatt, 2006; Arterberry, 2008; Imura et al., 2008). They also show preference to patterns with more elements, more curved lines, and symmetrical patterns (Bornstein, Ferdinandsen, & Gross 1981; Fantz & Miranda, 1975).

Even though there are some general findings on infants’ visual abilities, research in early preferences mainly examines infants’ preferences to faces. The accumulating evidence in this area is in line with infants’ visual sensitivities. In particular, infants are attracted to symmetrical human face and face-like configurations (Langlois et al., 1987; Kellman & Arterberry, 2006). Infants as young as 4 months prefer attractive faces that are also rated as
In another study with infants, Krentz and Earl (2013) found that, like adults, 6-month-old infants preferred original abstract art when its complexity and contrast were kept intact. Adults also prefer abstract expressionist art to very similar painting created by children or animals such as monkeys and elephants (Hawley-Dolan & Winner, 2011). These similarities in original abstract art preferences suggest that perceptual primitives could play a role in art appreciation starting at a very early age. Again, it is not clear what kind of abstract art infants prefer. For example, is it the patterns in abstract art more than objects that capture their attention? Another point that needs further attention is how initial objective factors are shaped by experience. As in the case of face attractiveness, infants’ visual art preferences might be influenced by their environment from very early on.

**Studying Infants’ Visual Art Preferences**

Although the above-mentioned studies provide evidence for how early perceptual analyses may drive the development of preferences for visual arts, they do not display a full picture on what type of artwork infants prefer. To examine this question, we need to investigate very early stages of art appreciation – preferences of artwork. The relative impact of each piece in the aesthetic triad still needs to be addressed.

As Leder et al. (2004) proposed, for both aesthetic judgment and aesthetic pleasure, the first stage starts with perceptual analyses of the artwork. Then, with previous experience, implicit judgments (memory, familiarity with the artwork) will lead to explicit judgments (content, style) of art. In this respect, sensation, emerged by perceptual analyses, will be intertwined with knowledge. For example, Lin and Thomas (2002) showed that 4-year-old children were similar to young adults in their responses to different art genres (abstract, modern, humorous, and cartoon art). Three- to 5-year-old children were also sensitive to the style in the paintings (Steinberg & DeLoache, 1986). Yet, by preschool age children are already immersed in the values of their culture. A true analysis of these stages and their interactions require studying very young infants in a longitudinal design. In particular, to analyze the visual attributes infants prefer, one needs to study young prelinguistic infants first.

Rather than using discrimination studies, the first step should be the examination of infants’ pure visual preferences. For instance, do young children prefer colorful, complex abstract paintings compared to colorful representations of nature? What guides their overall attention in those paintings beyond the low-level visual processing? How do low-level...
perceptual primitives interact with cultural and environmental factors (i.e., exposure to artwork from very early on)? The use of implicit judgment tasks such as eye-tracking and preferential looking can reveal early tendencies of children to visual art. Later, the same children can be tested by implicit and explicit aesthetic judgments at different time points to see the changes in children’s preferences of artwork. This longitudinal methodology will allow us to understand the individual differences (both personal and environmental) in children’s art appreciation.

In conclusion, we need to better understand how and which perceptual primitives guide attention to certain features in visual art. Studying infants and children are most likely to identify those visual attributes that are universally preferred as well as those that diverge across development and culture.

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I’m Not a Doctor, but I Play One on TV: Children and Adults’ Understanding of Acting

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Abstract
Realistic acting surrounds us on television, movies and on stages. It is the dominant form of play seen in Western culture, and yet we do not have a psychology of how children and adults understand the dual nature of acting—the actor and his/her character. In two studies, we investigated how adults and children understand the personality, skills, emotional states and physical characteristics of actors while they portray characters, and if they confuse actors with their characters. We explored when children develop the capacity to distinguish actors from the characteristics they portray and how and when adults continue to confuse actors and characters. Children do not seem to understand acting until at least five years old, when they begin to distinguish how and when traits transfer. Adults too judge that states and traits transfer, but distinguish between different kinds of characteristics in their judgments.

Keywords: acting; pretense; social cognition; interpersonal judgments.

Although it has been around for centuries, there is almost no psychological research on acting. Watching others act is one of the most consumed pleasures of modern life (Abraham, Flood, Sobek & Thorn, 2011; Bloom 2010) with children watching more than four hours of television per day, and the average American adult watching three hours of television per day (Abraham et al., 2011), not to mention the large amounts of money spent on movies and theatrical shows. However, modern Western acting, with its focus on realistic behavior and action, is relatively new. Before the early 20th century, performance was highly stylized, and closer to what we might think of today as oration or melodrama (Gordon, 2006). This realism therefore cannot be a biological adaptation. We are unlikely to find an “understanding realistic acting” module in the brain. Hence, understanding acting is likely to draw on other cognitive capacities (see Goldstein & Bloom 2011). The realistic perceptual nature of acting may cause confusion about what is real and what is fictional, when audience members think about actors and their traits. Indeed, there are numerous anecdotes about actors being confused with their characters. For example, Leonard Nimoy was often thought of as cold and unemotional like his Vulcan character, Mr. Spock, so much so that he wrote a book entitled “I am not Spock” (Nimoy, 1975; of note, he has since changed his mind and written a second book entitled “I am Spock” [Nimoy, 1995]). Interviews with famous actors often center around questions of how they are similar to or affected by their portrayals of their characters. But to this point, no work I know of has investigated whether children and adults are actually confused by the realistic nature of acting and conflate actors with their characters in any systematic way.

In the two studies presented here, I focus on the question of how children and adults understand realistic acting. Specifically, how do children and adults understand that there is a dual nature to acting: the actor, with his characteristics, skills and emotional states, and the character, with his matching (or different) emotions, characteristics, and physical states.

How do children and adults think about the dual nature of acting? One possibility is that they have a lay theory that the actor and the character are one and the same. Like a frog turning into a prince, they may believe an actor fully becomes a character while portraying her. Alternatively, they may believe that nothing about a character transfers to an actor; that the actor stays completely separate, walled off from the character. The character is simply a mask, with no deeper effects. However, a third possibility is that children and adults differentiate by what type of characteristics the actor is portraying. Children and adults may treat the portrayal of personality traits, for example, as different from the portrayal of physical states, emotional states, or knowledge and skills, believing some transfer more than others.

Although no psychological studies have been conducted on what audience members believe about actors’ states and traits, acting theory can provide guidance as to what actors may be trying to do, which could then inform what audience members believe is occurring.

In the Western tradition of acting training, there are two extremes: for simplicity, I will call them “Method” and “Technique”. “Method” theory, originally developed by Konstantin Stanislavsky (1936/1989) and continued with Lee Strasberg and Stella Adler (Hull, 1985) proposes that in order to be effective, an actor must feel the emotions of his character while preparing and playing a role. The use of personal memory of emotions and creation of fully felt experiences is key in the creation of realistic portrayal. In contrast, the “Technique” theory proposes that acting should instead come from the “outside-in”, beginning first with the physical nature of a character, her walk and posture, with no need for the actor to experience any emotion at all. In fact, the theory here is that the personal emotions of the actor get in the way. Most actors will report that they do not ascribe to one acting theory, but instead pick and choose from theory, training, and individual teachers to create a theory that works best for them, even changing between roles which theory they use. A systematic study of actors in the Netherlands
found that at least when performing (rehearsal was not studied), actors tend to focus on the task at hand: finding their light, or remembering their lines, rather than any focus on feeling emotions at all (Konijn, 2000). For a full discussion and hypotheses about the effects of acting training, see Goldstein & Winner, 2010. Despite these differing theories, there is a mythos in the United States of the actor who is completely in their role and truly emotionally involved—Marlon Brando and Dustin Hoffman are well known exemplars. However, how this translates to adults’ and children’s theories of acting is still unknown.

Children have a difficult time differentiating between portrayed emotions and felt emotions for a long time in development, typically not coming to understand that someone can feel one thing and portray another until six years old (Wellman & Liu, 2004). Therefore, even without an actual theory of how acting might work, children could be confused by the representational nature of what is occurring and conflate actor and character. It is less clear what adults believe. One could make an argument that it depends on the type of portrayal occurring; it is easy and obvious to know that someone being beaten up on a movie is not actually being beat up, but that camera work and make up are causing that perception. Personality states are a bit trickier: perhaps Hugh Laurie was cast as the genius but interpersonally rude Dr. House because he is actually smart and rude, or perhaps playing Dr. House for many years made him rude and taught him about being a doctor.

In the current studies, I used explicit questions about different types of characteristics to investigate adult theories about acting, and videos created in lab to ask both children and adults whether they believed portrayed emotional, physical, knowledge and personality traits transferred from the portrayal of a character back to an actor.

### Study 1

Study 1 investigated whether adults explicitly endorsed the idea that actors were conflated with their characters, experiencing or having the same traits and states as they were portraying. I looked at a variety of characteristics, in order to determine not only if adults transferred characteristics from character to actor at all, but also whether adults explicitly treated the portrayal of emotional states differently than the portrayal of personality traits, knowledge or physical states when making judgments of actors.

#### Methods

**Participants and Procedure.** Eighty-one participants (62% male, Ages 18-31, Mage = 24 years, 5 mo) were recruited from Amazon’s Mechanical Turk and participated in exchange for a small payment. Two participants were discarded for failing a control question. After consent, participants were told they were going to answer some questions about acting and were asked who their favorite actor was. Then, participants answered five questions (out of a possible twenty) about whether actors experienced the characteristics they were portraying. The questions were framed “When an actor is portraying a character who is [characteristic] in the course of a scene, how [characteristic] do you think the actor needs to be IN REAL LIFE?” Participants were given a 0 (not at all) – 100 (completely) slider response option. The twenty items included five physical traits (weak, blind, drunk, paralyzed, strong), five emotional states (in love, scared, surprised, happy, sad), five personality traits (rude, flamboyant, ditzy, cheap, romantic), and five skills (cheerleading, dancing, coaching football, boxing, reading others’ emotions). Participants answered all five questions about one type of trait.

#### Results

To investigate whether participants believed that actors experience traits they portray, I conducted a one-way t-test against 0 (no transfer) across traits. Participants believed that actors were affected by their portrayals and experienced the traits they portray significantly more than zero, t (78) = 12.10, p < .001. Then, to investigate whether participants differentiated between emotional states, physical states, personality traits, and knowledge, I conducted a one-way ANOVA with type of trait judged as the between subjects variable. There was a significant difference by type of characteristic judged, F (3,78) = 15.33, p < .01. Means for each type of characteristic can be found in Figure 1. Tukey’s post-hoc tests indicated that participants believed Personality traits were most likely to be experienced by the actor, significantly more than Emotions (p < .01), Skills, (p < .01), or Physical states (p < .01). Participants did not differ among Physical states, Emotions, and Skills.

![Figure 1: Study 1 judgments of transfer from character to actor.](image-url)
(59%), boxing (53%), cheerleading (44%) or coaching football (40%). A repeated-measures ANOVA with emotion as the within-subject variable showed a significant difference of emotion type transfer, $F(4,14) = 4.977, p = .01$. Participants judged happiness as more likely to be an emotion shared by actor and character (40%) than sadness (30.8%), surprise (30.5%), fear (28.8%) or love (18%). A repeated-measures ANOVA with personality trait as the within-subject variable showed no significant difference by personality trait, $F(4, 16) = 2.18, p = .11$. Finally a repeated-measures ANOVA with physical trait as the within-subject variable showed a significant difference of physical trait type transfer, $F(4, 17) = 24.41, p < .01$. Participants judged strength as most likely to be a physical trait shared by actor and character (54.9%), followed by weakness (20.42%), and drunk (13.28%). Blindness (7.04%) and paralyses (2.9%) were judged as very unlikely to transfer.

Discussion

Overall, adults do seem to think that characteristics are shared between characters and actors. However, they differentiate between the types of characteristics shared, believing personality traits are much more likely to be shared than emotions, skills, or physical states. Within each of these categories, adults differentiate even further, believing physical traits such as strength and weakness are much more likely to be shared than blindness or paralyses, and happiness more likely to transfer than surprise or fear. Therefore, adults do not seem to be treating acting either as a mask that is simply put on and taken off, nor as a complete transformation, as when as frog becomes a prince. Instead, adults differentiate between the type of characteristics being portrayed, and how those different characteristics may be shared or transfer from character to actor.

This study is just a first step to a previously uninvestigated question: how to adults understand acting? Future research will investigate how adults react when presented with actual examples of actors acting. When faced with the perceptual cues of a professional actor creating an emotional state, physical trait, personality trait, or skill, adults may respond differently, believing perhaps that traits are even more likely to transfer, or that emotions specifically are more likely to transfer. There may also be differences in adult judgments of the transfer of character’s traits to actors when differentiating between comedic and dramatic performances, the length of time an actor played a role, or when judging more and less well known actors. There may also be differences in judgments about award winning versus “bad” performances, based on where the acting is taking place (onstage or onscreen) and when taking acting style (more subtle versus larger) into account.

There is also a remaining question of how children understand acting. Although children’s understanding of pretend generally is well researched, no work has previously looked at how children understand this specific domain of pretense: perceptually realistic acting in which behavior is as close to the everyday as possible. Studying children’s understanding of acting can provide us with a lens to investigate how children understanding the stability or fragility of social cognitive characteristics: do children believe that an actor’s emotional and physical states are stable, or do they believe that by pretending those states are something different, the actor is changing herself? And do children differentiate between the type of portrayal? That is, are states more or less likely to transfer given a more or less realistic portrayal?

Study 2

In Study 2, I showed lab created examples of acting to children and adults, and asked them whether or not they believed the person acting was actually experiencing what they were portraying. I focused on just two types of characteristics: physical states and emotional states, and contrasted whether the acting was realistic or unrealistic in nature. Children engage in nonrealistic portrayals of states and traits constantly in their own pretend play but realistic portrayals are mostly confined to watching others on screens or stage. While preschool children for the most part do not misunderstand pretend and cross the fiction/reality boundary when making judgments about the nature of objects in pretend scenarios (Harris, 2000), they are less able to make judgments about pretend emotions (Wellman & Liu, 2004).

Methods

Participants. Twenty-one 3-year-olds (36 to 47 months, $M = 43$ months, $SD = 3$ months; 11 female), thirty-five 4-year-olds (49 to 59 months, $M = 54$ months, $SD = 3$ months; 15 female), twenty-three 5-year-olds (60 to 71 months, $M = 65$ months, $SD = 3$ months; 11 female), and 12 adults (19 to 58 years, $M = 37$ years, 3 months, $SD = 14$ months; 8 female) participated. An additional nine 3-year-olds, three 4-year-olds, and three 5-year-olds did not complete the study due to failure to properly answer control questions (i.e., showed a “yes” or “no” bias, or responded incorrectly to physical control questions), or in the case of two 3-year-olds, because they became distressed at watching the video in which someone portrayed “sad” and cried. Child participants were recruited from a database of families who had agreed to participate in developmental research or were students at local preschools that had agreed to participate in psychological studies. They were given a small toy in exchange for their participation. Adult participants were either working in a psychology laboratory and had no knowledge of the study, or were recruited while walking across campus and participated in exchange for candy. Almost all participants were Caucasian and middle or upper-middle class, representative of the community from which they were drawn.

Procedure. After informed consent, child participants were told they would be shown some videos and asked some
questions. Children then answered two questions to introduce the concept of asking about reality. The experimenter asked: “Am I really wearing a hat?” (no) and “Am I really wearing shoes?” (yes). After being randomly assigned to condition, children in the nonrealistic condition were informed that they would be watching “pretend” videos (which contained nonrealistic acting) and children in the realistic condition were told they would be watching “acting” videos (which contained realistic acting). They were then asked if they knew what pretending or acting was (depending on condition), and to define the term. Experimenters were careful not to use the word “pretending” when discussing realistic acting, and children did not use the word “pretending” in their descriptions of acting.

All children then watched the same two warm-up videos, in which the person in each video was introduced as either “someone who liked to pretend to play different characters on movies and TV” or “someone who likes to act as different characters on movies and TV.” After the warm up videos, if a child had not previously correctly defined pretending or acting, the experimenter verified that the child knew the concept of pretending or acting by again asking if they knew what pretending or acting was, and to give an example. Children who still could not give a correct example were not run in the study. Remaining participants were then shown the target videos in their assigned condition.

Adult participants did not have a warm up procedure; they were simply introduced to the target videos as follows: “You will now watch a series of videos in which the person is pretending/acting, and then answer some questions.”

Videos. Two sets of eight videos featuring the same target performers were created for the studies, one nonrealistically acted, and the other realistically acted. In all of the videos, the target crossed the frame and stopped in the middle, usually at a desk. The target then performed a physical action and had an emotional or physical reaction, and then continued off frame. For example, in the “tired” video, the target walked across the screen, did two jumping jacks, and then said: “I am so tired. I don’t think I could do another jumping jack, I am so tired.” All videos were filmed in the same office with the same background.

In the nonrealistic acting videos, the actions were clearly overdone and over acted. These videos used as their basis the cues to pretend that mothers use when pretending with their children (Lillard & Witherington, 2004; Lillard, Nishida, Massaro, Vaish, Ma, & McRoberts, 2007), but in an extremely exaggerated manner. Targets in the nonrealistic acting videos had larger-than-life movements and vocal expressions. They made eye contact with the video camera and often smiled in a playful manner, even when enacting the characteristic “hurt” or “sad.”

In the realistic acting set of videos, the actions were as close to realistic as possible. These videos were comparatively understated, and the target did not make eye contact with the camera or smile (except in the “happy” video). The actor attempted to act as if the emotion or physical state was actually occurring to him or her in the moment of recording.

All participants watched either eight non-realistically acted videos (four physical, four emotional) or eight realistically acted videos (four physical, four emotional). Videos were presented in a random order on a computer in a PowerPoint slide show, advanced by the experimenter.

Questions. After each video, participants were asked three questions: a “yes” physical control question (e.g., “When she did that, was she really wearing blue jeans?”), a “no” physical control question (e.g. When he did that, was he really sitting down?), and our target question, asking whether the children believed that the actor was actually experiencing the characteristic he/she was portraying (e.g. When she did that, was she really tired?). All questions were asked while the video was frozen, but the questions could not be answered based on the frozen screen shot.

Results

To analyze whether children and adults believed that the actor was experiencing the characteristics portrayed, we first conducted a 4 (Age group: 3, 4, 5, Adult) X 2 (Portrayal type: Realistic, Nonrealistic) X 2 (Characteristic: Physical, Emotional) mixed-model ANOVA. Figure 2 shows the results by age, and portrayal type. Higher percentages indicate that the participant responded that the actor in the video was really experiencing the characteristic they were portraying (i.e. She is really tired, really hurt, really sad).

![Figure 2. Study 2 judgments of transfer from character to actor by age, characteristic, and portrayal type.](image)

We found a significant main effect of age, $F(3, 81) = 35.23$, $p < .001$. Pairwise comparisons showed that Adults ($M = 0.2$) responded significantly differently than 5-, 4-, and 3-year-olds ($p < .001$). Five-year-olds ($M = 3.76$) responded significantly differently from both 3- ($M = 7.08$) and 4-year-olds ($M = 6.56$), $ps < .001$, but 3- and 4-year olds did not respond significantly differently from each other.

There was also a main effect of portrayal type, $F(1, 81) = 3.623$, $p < .001$, with children and adults in the realistic acting condition more likely to believe the actor was actually
experiencing the characteristic ($M = 5.12$) than children and adults in the nonrealistic acting condition ($M = 3.68$). There was also a main effect of characteristic type $F (1, 81) = 8.77$, $p = .004$, with children and adults believing that the actor was actually experiencing the characteristic for emotional ($M = 2.36$) more than physical ($M = 2.0$) characteristics.

To clarify these findings, we conducted a series of 2 (Portrayal Type: Realistic, Nonrealistic) x 2 (Characteristic: Emotional, Physical) ANOVAs for each age group. There were no significant differences between portrayal or characteristic type for 3-year-olds or Adults. Five-year-olds showed a significant effect of portrayal type, $F (1, 21) = 10.99$, $p = .003$, answering that characteristics were more likely to transfer for realistic ($M = 5.44$) than nonrealistic actors ($M = 2.0$), and a significant difference by characteristic type across conditions, $F (1, 21) = 4.59$, $p = .044$, answering that emotional characteristics ($M = 1.88$) were more likely to transfer than physical characteristics ($M = 1.56$).

**Discussion**

Overall, children are highly likely to believe that characteristics transfer from character to actor until they are at least five years old. Three- and four-year-olds tended to answer that for both people acting in a realistic manner, and for people acting in a nonrealistic manner, the actor was actually experiencing the physical and the emotional characteristics they portrayed. At this age, children do not seem to be sensitive to the differences between realistic and unrealistic actors. Five-year-olds, however, made finer distinctions. They were more likely to transfer emotional characteristics than physical ones, and more likely to transfer for realistic than unrealistic portrayals. Adults believed that neither the realistic nor the unrealistic actor was experiencing the characteristics they were portraying, unlike in Study 1.

These findings contrast with what has been previously found in investigations of children's understanding of pretend. Children in this study are showing a fundamental misunderstanding of acting: believing until five years old that all characteristics transfer from portrayal to actor, regardless of type of characteristic or type of portrayed.

Why is this the case? At an explicit level (which is what is tested in most developmental experiments having to do with pretense), children might be fully able to distinguish the real from the unreal. But our experiment involved showing children salient and interesting actions by emoting and enthusiastic adults. It might be difficult, at a more implicit level, for children to inhibit the feeling that this is really happening. Indeed, this also could be what happens to adults who confuse actors and the characters they play—although they cognitively know that it is fake, they are unable to see past that fact in the moment of engagement with the actor, and they therefore later recall the actor as having the properties of the character. Note also that some sort of treating-as-if-it-were-real might be essential part of the pleasure of fiction. While we know that stories are not real, part of our enjoyment is responding to them as if they were—sympathizing with the main characters, hoping that the villain will be punished, and so on (Bloom, 2010).

Another possibility is that confusion of actor and character might reflect a default response to any sort of representational enactment, thus the conflation of actor and character regardless of type of portrayal or characteristic. What occurs over development, then, is the capacity to staunch this conflation. The 5-year-olds in our study attribute characteristics less for nonrealistic acting than for realistic acting, and the adults never attribute characteristics for nonrealistic enactment. Plainly the 5-year-olds are not yet fully mature—in both of the above studies, they behave differently from adults. It is likely then that realistic acting takes a long time to fully grasp.

**General Discussion**

In two studies investigating what children and adults think about acting, I found that at three- and four- years-old, children believe that both emotional and physical characteristics transfer from character to actor, regardless of the acting style of the actor. At five years old, children distinguish between type of portrayal and characteristics, but still believe characteristics transfer. Adults, when asked explicitly, also believe characteristics transfer, but much more for personality states than for emotions, physical states or skills.

Why do children and adults believe that characteristics transfer? One possibility is that they are actually correct—that it is difficult if not impossible to act out a personality trait if the actor does not possess the personality trait in themselves, at least somewhat. This would mean that actors are merely tapping in to some essential part of themselves in order to play a role.

In ancient Greece and Rome, actors were often cast out because of the “magic” they could do in creating another’s personhood. In more modern times, actresses in particular were considered “bad” women because they could play various roles and actions onstage and therefore could not possibly be reputable individuals (Benedetti, 2007). Some of these assumptions seem to linger—adults and children alike think acting affects the person creating the portrayal.

More studies with actors are needed, both to investigate what kinds of acting theories actors are actually using, and how and when acting affects actors. We know that for children and adolescents, acting seems to positively affect empathy, theory of mind, and emotion regulation (Goldstein & Winner, 2012; Goldstein, Tamir & Winner, 2013), but questions about actors’ personalities being affected by acting remain.

Future work will investigate a further level of understanding acting that our studies do not even approach: the problem of a sustained portrayal of a fully realized character—how most of us interact with actors in movies and television. Given the confusion in these simple experiments, we imagine that children’s misunderstanding of a character portrayed over several hours of a movie is even more drastic, with children believing that not only momentary
characteristics transfer from portrayal to actor, but that personality traits and knowledge transfer as well.

There is undoubtedly much work to be done on the question of children’s and adults’ understanding of acting, especially given the large bodies of work on children’s understanding of pretend, story books, and lying, and the large amounts of exposure individuals receive to acting on a daily basis in our modern culture.

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References
Aesthetic Pleasure versus Aesthetic Interest: 
A Differentiation Based on Processing Dynamics and Processing Style

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Abstract
Existing research has well-established that pleasure and interest are distinct positive aesthetic responses. Yet, much empirical research employs only generic measures of positive aesthetic responses, causing some fundamental contradictions in the literature. We address these contradictions by providing a theoretical integration of the formation of pleasure and interest. Specifically, by taking a dual-process perspective on fluency theory, we differentiate the two responses based on processing dynamics and processing style. Using abstract art pictures as stimuli, we find that pleasure is triggered by a perceiver’s initial fluency experience from automatically processing a stimulus. Regarding interest, we give empirical indication that a process of disfluency reduction elicits interest, and that disfluency reduction is a function of processing motivation and stimulus-based processing affordance.

Keywords: empirical aesthetics; interest; pleasure; processing fluency; dual-process theories; epistemic processing goal.

Introduction
In everyday life, peoples’ aesthetic preferences appear to have remarkably distinct foundations. For a vivid example, consider the poster that has hung in your kitchen for ages, compared to the modern artwork your spouse has recently staged in your living room. Presumably the poster does not catch your attention anymore, yet looking at it gives you a good feeling, and you would certainly say that you like it. By contrast, the artwork still makes you pause to think, and even though you were not very fond of it initially, you now like it. Hence, even though you have a positive aesthetic response to both visual stimuli, clearly the formation processes and the types of positive aesthetic responses differ. Whereas the response to the poster is fairly well captured by immediate aesthetic pleasure, the response to the artwork is closer to a sense of aesthetic interest.

Even though existing research on aesthetic preferences has long established that aesthetic pleasure and interest are two distinct positive aesthetic responses, most empirical research considers only liking as the dependent construct, causing some fundamental contradictions in the literature. In particular, many studies find that the positivity of an aesthetic response is a monotonically increasing function of the fluency with which a perceiver can process an object (for a review see: Reber, Schwarz, & Winkielman, 2004). In contrast, plenty of other research shows that an aesthetic response is negatively influenced by fluent processing. For instance, Landwehr, Labroo, and Herrmann (2011) showed that aesthetic liking of a design is positively influenced by its complexity, and that it is thus inversely related to high processing fluency. Other research demonstrated that when people are pursuing a goal (Labroo & Kim, 2009) or when they believe the target object to be special or unique (Pocheptsova, Labroo, & Dhar, 2010), subjective feelings of effort or difficulty rather than ease (i.e. fluency) will improve evaluation of a target. Finally, it has been shown that fluency resulting from repeated stimulus exposure increases liking only up to some critical level, and that with further exposure liking decreases (Landwehr, Wentzel, & Herrmann, 2013; Van den Bergh & Vrana, 1998).

These contradictory results may be resolved by acknowledging that aesthetic liking is an overly vague construct to the study of aesthetic preferences, and that it is necessary to distinguish between pleasure and interest. However, a more differentiated understanding of positive aesthetic responses requires pleasure and interest to be embedded in a coherent theoretical framework. The present paper establishes this theoretical coherence by integrating a dual-process perspective from social psychology (Strack & Deutsch, 2004) into processing fluency theory (Reber et al., 2004).

Against this background, the key research aim is to understand the formation processes of pleasure and interest, and to explain why and when the one or the other aesthetic response is likely to be triggered. In doing so, this research makes at least three substantial contributions to the literature. First, on a theoretical level, it extends current theorizing on processing fluency theory. Specifically, by introducing a dual-process perspective on fluency theory, it proposes a second kind of processing dynamics to mediate the relationship between the fluency of a stimulus and the subsequent aesthetic response. Second, the formation of pleasure and interest is empirically examined in a theoretically coherent manner that allows differentiating, and comparing the two responses. Lastly, it makes an effort to derive implications for the perception of different types of aesthetic stimuli (e.g., product design vs. contemporary art).

We structure the remainder of the article as follows. First, in the theoretical section, we will briefly review current work on the formation of pleasure and interest. In the empirical
section we describe our empirical study, and we report the results. Finally, we conclude by discussing theoretical and practical implications of our research and avenues for future research.

**Theoretical Background**

**Current Theoretical Accounts on the Formation of Aesthetic Pleasure and Aesthetic Interest**

In 2004, Reber and colleagues put forward a seminal theoretical account that explains positive aesthetic responses on the basis of processing dynamics. They proposed that higher fluency is inherently positive and experienced as gut-level positive affect (Winkielman & Cacioppo 2001). Because perceivers “by default” interpret their fluency-based affective reactions as representing their disposition toward the stimulus, the stimulus is evaluated more positively (Reber et al., 2004; Winkielman, Schwarz, Fazendeiro, & Reber, 2003). Theoretically, a fluency-based positive aesthetic response is conceived as aesthetic pleasure; a “pleasurable subjective experience that is directed toward an object and not mediated by intervening reasoning” (Reber et al., 2004, p. 365). However, with regard to the empirical operationalization, fluency-based aesthetic pleasure is commonly measured by items referring to aesthetic liking (e.g., Reber et al., 2004; Winkielman et al., 2003).

Even though there is ample empirical evidence for the positive effect of fluency on aesthetic preferences, several studies show a negative relationship between fluency and liking (e.g., Labroo & Kim; Landwehr et al., 2011, 2013; 2009; Pocheptsova et al., 2010; Van den Bergh & Vrana, 1998). These findings suggest that aesthetic liking is too ambiguous as to depict solely pleasure-based liking. Moreover, these data hint at a further process that is negatively related to fluency but that also elicits positive aesthetic responses such as liking. Long before Reber and colleagues (2004) introduced the fluency theory of aesthetic pleasure, Berlyne established interest as another important positive aesthetic response (Berlyne, 1963, 1970, 1971). He proposed physiological arousal potential as the key mediating mechanism between objective stimulus properties and an aesthetic response, and he found that interest is triggered by arousal-raising collative variables such as complexity or novelty, both of which are negatively related to fluency and hence pleasure.

More recently, Silvia (2005a, 2005b) proposed an appraisal approach to emotion for the explanation of aesthetic interest. Silvia (2005a, 2005b, 2005c) showed that interest is elicited through two consecutive appraisal components; an appraisal of novelty-complexity, viewed as a family of appraisals related to Berlyne’s collative variables, and an appraisal of coping potential, conceptualized as the ability to understand the stimulus that has been identified as being hard to understand in the first appraisal. Using slightly different terminology, Armstrong and Detweiler-Bedell (2008) offer a theoretical account that also distinguishes between pleasure (prettiness) and interest (beauty) by relating the first response to a fluency-based affective reaction, and the latter to processing associated with instantiations of disfluent processing. In their view, beauty allows only the sense of the prospect of understanding (i.e., fluent processing is only anticipated).

Importantly, the conceptualizations of interest/beauty in all of the presented accounts are similar in that they involve the desire to incorporate new information from a stimulus. In this respect, they all require a perceiver to actively and deliberately process a stimulus. For the realization of interest, this demand for cognitive capacity is in sharp contrast to the gut-level affective reaction that establishes pleasure within the tenets of fluency theory.

**Theoretical Integration of the Formation of Pleasure and Interest**

According to our view, the dichotomy in terms of processing style that demarcates the two broad theoretical approaches to aesthetic responses (and thus aesthetic pleasure and interest) lucidly mirrors the classical duality of mental processes as postulated by dozens of dual-process theories (e.g., Strack & Deutsch, 2004). Hence, we propose adopting a dual-process perspective on fluency theory to explain both pleasure and interest in a theoretically coherent manner.

Dual-process theories divide the realm of mental processes into two general categories of processing depending on whether they operate in an automatic or in a controlled fashion (Gawronski & Creighton, 2013), and we likewise assume that aesthetic processing can either occur automatically or in a deliberate, controlled manner.

Both automatic and controlled processing is accompanied by meta-cognitive experiences related to the dynamics of processing (see Schwarz, 2004), and we propose that whereas the meta-cognitive experience from automatic processing may elicit pleasure (see Reber et al., 2004), the meta-cognitive experience from the controlled processing may evoke interest. Specifically, if the automatic processing of a stimulus is accompanied by a meta-cognitive experience of fluency, this should elicit a positive affective reaction that corresponds to pleasure. If controlled processing is accompanied by a meta-cognitive feeling of disfluency reduction, interest occurs.

In the dual-process paradigm, controlled processing is usually a function of the ability and the motivation to process (Palmer, Schloss, & Sammartino 2013). While we assume that the ability to process is present in the usual situations in which people consider an object’s aesthetics, this is not necessarily the case for the motivation to process. Therefore, we suggest that the motivation to process a stimulus is exogenously determined by the epistemic processing goal with which a perceiver approaches a target; this goal can be either knowledge preservation or knowledge expansion (see Armstrong & Detweiler-Bedell, 2008). Under an epistemic goal of knowledge expansion, a perceiver will seek novelty to establish new cognitive structures, which pushes the motivation for controlled processing. In contrast, when an epistemic goal of knowledge preservation is enabled, a
person will avoid the controlled processing of novelty to preserve or maintain existing cognitive knowledge structures. The relation between stimulus characteristics, epistemic goals, processing dynamics, and aesthetic pleasure and interest is tested in the subsequent empirical study.

**Method**

In accordance with our theoretical considerations, we expect that the higher the initial, non-reflective fluency that is experienced from automatically processing a stimulus, the higher will be pleasure. For interest, we hypothesize that the higher the experience of disfluency reduction, the higher will be interest, and that disfluency reduction is contingent upon controlled stimulus processing.

In the following we will begin with describing the experimental design of our study, and the stimuli that were used. We will then continue with delineating the study’s procedure.

**Design and Stimuli**

We used a 3x2x2 mixed factorial experimental design where the first factor was a within subjects manipulation of fluency, the second factor was a between subjects manipulation of epistemic processing goal (i.e., the processing style), and the third factor was a between subjects manipulation of the measured aesthetic response (i.e., pleasure vs. interest). Fluency was manipulated within subjects to increase the fluency-discrepancies of different stimuli (Hansen & Wänke, 2013).

We used colored art pictures as stimuli in our study (the pictures were standardized to have equal dimensions). The pictures are generative digital art, all from one single artist, and can be broadly described as abstract art. In a pre-test we presented 458 of these pictures to participants and collected their subjective fluency experience for each picture (each picture was rated by at least 34 participants). Subjective fluency experience was measured with a newly developed three items questionnaire using a visual analog scale with 101 points and the following labels: “The process of thinking about this picture …” (1) “is difficult for me” / “comes naturally to me”, (2) “is exhausting for me” / “is easy for me”, (3) “I perceive to be sluggish” / “I perceive to be smooth”. Psychometric analysis confirmed a reliable measurement of subjective fluency (α = .978). We selected three of the most disfluent, three of the most fluent, and three medium fluent pictures as stimuli for our study. Thus, our final stimulus set consisted of nine pictures, representing three fluency levels (low, medium, high), with three operationalizations per fluency level (low fluency pictures: M=36.72, medium fluency pictures: M=56.16, high fluency pictures: M=74.84).

As elaborated, we assume that aesthetic processing style is a function of the ability and the motivation to aesthetically process a stimulus. Because we believe participants to have the ability to process the stimuli in our study, we focused on activating participants’ processing motivation. The processing motivation was manipulated by varying participants’ epistemic processing goal between the goal of knowledge preservation and knowledge expansion.

**Procedure**

To ensure that our selected stimuli represent different levels of fluency, all participants were initially asked to evaluate the nine pictures in a randomly presented order on subjective fluency (same 3-item questionnaire of fluency as in the pre-test, again rated on the visual analog scales with 101 points).

Before participants were next asked to evaluate the pictures, they were randomly assigned to one of the between subjects conditions of epistemic processing goal, and to one dependent measure (pleasure vs. interest). Specifically, in the knowledge preservation condition, participants were told to make their evaluations of pleasure/interest based on their immediate gut-feeling. In the knowledge expansion condition, participants were asked to explicitly conceive of the pictures as artworks, and they had to create an appropriate title for each picture before making their evaluations. Pleasure and interest were each measured with two items (also on visual analog scales with 101 points, pictures were again presented randomly). The items for pleasure were: “I perceive the picture to be …” (1) “displeasing” / “pleasing”, (2) “unenjoyable” / “enjoyable”. Interest was measured with two items adapted from Silvia (2005a, 2005b); “I perceive the picture to be …” (1) “disinteresting” / “interesting”, (2) “boring” / “exciting”. Afterwards, we measured (3-item scale) how intensively participants interacted with the pictures before they evaluated them for pleasure/interest. For the last time, participants were then exposed to the pictures, and we asked them to give a gut-level evaluation of the pictures’ currently experienced fluency. Finally, we obtained several individual difference variables related to art, as well as participants’ demographics.

We conducted our study using Amazon M’Turk platform. Overall, a sample of 424 subjects participated in our study (53.3% female, mean age=28); 215 participants rated the pictures for pleasure, and 209 participants rated the pictures for interest.

**Results**

In all subsequent analyses, we averaged the ratings on pleasure, interest, and fluency across the three operationalizations per fluency level.

For reasons of clarity, we will proceed in reporting our results separately for pleasure and interest, beginning with the results for pleasure, and continuing with the results for interest.

| Table 1: Mean values and standard errors (SE) for pleasure, initial fluency, and final fluency. |  |  |
|---|---|---|---|---|---|
| Pleasure | Initial Fluency | Final Fluency | | | |
| Value | SE | Value | SE | Value | SE |
| 59.67 | 5.24 | 36.72 | 1.83 | 74.84 | 5.67 |
Table 2: Mean values and standard errors (SE) for interest, initial fluency, and fluency change.

<table>
<thead>
<tr>
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<th>Initial Fluency</th>
<th>Pleasure</th>
<th>Final Fluency</th>
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<tbody>
<tr>
<td></td>
<td>low fluency</td>
<td>medium fluency</td>
<td>high fluency</td>
</tr>
<tr>
<td>Knowledge preservation</td>
<td>44.57 (1.40)</td>
<td>55.72 (1.36)</td>
<td>69.28 (1.33)</td>
</tr>
<tr>
<td>Knowledge expansion</td>
<td>52.05 (1.90)</td>
<td>57.50 (1.91)</td>
<td>67.52 (1.80)</td>
</tr>
</tbody>
</table>

- Aesthetic Pleasure

To ensure that the manipulation of fluency relates to differences in the subjectively perceived fluency of the pictures, we first analyzed the initial fluency ratings. The mean scores of the initial fluency evaluations per fluency level are depicted in Table 1. These descriptive results suggest that, as intended, subjects perceived the pictures in the medium fluency condition on average as more fluent than the pictures in the low fluency condition, but on average less fluent than the pictures in the high fluency condition. To provide further support for this conjecture, we conducted an ANOVA with the initial fluency rating per fluency category as the dependent variable. Because the design of our study features a repeated measures structure of fluency, we employed a repeated measures ANOVA; it shows a significant effect of the fluency manipulation on subjectively perceived fluency ($F(2,215)=193.672; p< .001; \eta^2 = .475$). LSD post hoc contrasts reveal that each of the three factor levels differ significantly from each other ($p< .001$).

To validate that the manipulation of the epistemic processing goal influenced participants’ engagement with the pictures as intended, we conducted an independent samples t-test that compares the mean scores of participants’ interaction with the pictures between the epistemic processing goal conditions. The results confirm a significant difference in the mean interaction scores for the knowledge preservation condition ($M=4.47$, $SD=1.55$) compared to the knowledge expansion condition ($M=5.92$, $SD=1.04$); $t(213)=-8.085$, $p< .001$.

The results for the mean pleasure ratings and the corresponding standard errors of the means across the experimental conditions are depicted in the second column of Table 1. The mean values show that pleasure increases across the different levels of experimental fluency, and that average pleasure is highest in the high fluency condition. On the basis of these results, one may infer that aesthetic pleasure is driven by perceivers’ initial, subjective fluency experience. Specifically, as the subjectively perceived fluency increases, so does aesthetic pleasure.

Comparing the mean pleasure ratings across the epistemic processing conditions (see Table 1) reveals that these ratings are constantly higher in the knowledge expansion condition than in the knowledge preservation condition. Because the pleasure ratings were obtained after the manipulation of the epistemic processing goal, and participants in the knowledge expansion condition interacted significantly more with the pictures than participants in the knowledge preservation condition, the former might have experienced a higher fluency right before providing their evaluation of pleasure. Therefore, we analyzed also the final fluency evaluations (Table 1, column 3). The descriptive results show that for the low fluency and the medium fluency condition, the mean scores of the final fluency evaluation are remarkably higher.
in the knowledge expansion condition. Hence, the higher pleasure ratings for the disfluent and medium fluent pictures in the knowledge expansion condition might be the result of a higher level of the finally perceived, gut-level fluency.

Aesthetic Interest

Also in the interest sample the manipulation of fluency proved successfully, as apparent by the results of a RM-ANOVA that compares the subjectively perceived initial fluency between the levels of manipulated fluency (F(2,209)=188.738; p< .001; n²=.476). LSD post hoc contrasts again revealed that each of the three factor levels differ significantly from each other (p< .001).

In addition, an independent samples t-test comparing the mean scores of participants’ interaction with the pictures confirmed that participants dealt significantly less intense with the pictures in the knowledge preservation condition (M=4.83, SD=1.61) than in the knowledge preservation condition (M=6.02, SD=1.01); t(207)=6.241, p< .001.

Mean scale ratings for interest were calculated; Table 2, column 2, shows these scores across the experimental conditions. These descriptive results suggest that mean interest scores do not vary in a noticeable manner on the different levels of fluency. However, mean interest scores are constantly higher in the knowledge expansion condition compared to the knowledge preservation condition.

We hypothesized that the effect of the processing experience of a picture on interest is mediated by a process of disfluency reduction. Hence, we analyzed fluency change scores, which we computed as the difference between the fluency evaluation after and before the manipulation of the epistemic processing goal (thus, a positive value indicates that disfluency reduction has occurred during the processing of the picture). As indicated in Table 2, column 3, only in the knowledge expansion condition remarkable fluency changes can be reported, especially for the disfluent pictures (i.e., the pictures in the low fluency condition). In the knowledge preservation condition, by contrast, the mean fluency changes are only marginal. This suggests that disfluency reduction is dependent on the epistemic processing goal of knowledge expansion, or, more generally, on controlled processing.

Comparing the mean fluency change scores with the initial fluency scores (Table 2, column 1 and 3) across the experimental fluency conditions shows that a lower mean fluency change is associated with a higher initial fluency score. Hence, it seems that the higher the initially perceived fluency, the lower is the scope left for fluency change. This association might explain the lack of variance in the interest ratings across the experimental fluency conditions.

Taken together, these results suggest that disfluency reduction triggers interest, and that disfluency reduction itself is dependent on the epistemic processing goal of the perceiver, as well as on the initially perceived fluency of the stimulus.

General Discussion

The objective of this research was to examine the formation processes of pleasure and interest based on theoretically coherent and parsimonious grounds. Drawing on extant literature, we proposed a differentiation of pleasure and interest that is based on processing dynamics and processing style.

Using abstract art pictures as stimuli, we developed an experimental study; the results provide initial support for our theoretical considerations. Specifically, our results suggest that pleasure is triggered by a perceiver’s initial fluency experience emanating directly and non-reflective from automatically processing a stimulus. That is, the higher the subjective fluency experience from automatically processing a stimulus, the higher is pleasure. With respect to interest, we find empirical indication that a process of disfluency reduction elicits interest. Furthermore, it appears that disfluency reduction is a function of processing motivation and stimulus-based processing affordance, i.e., the disfluency reduction potential offered by the stimulus. That is, we find that disfluency reduction (and consequently interest) requires the controlled processing of a stimulus, and that disfluency reduction is negatively related to the fluency that is perceived when initially and automatically processing the stimulus.

There are at least two theoretical notions that converge on the assumption that disfluency reduction evokes interest. First, people pursue the active goal of knowledge expansion during controlled processing (see Labroo & Kim, 2009), and a reduction of difficulty of processing is perceived as instrumental in satisfying this goal. Second, our conceptualization of interest is theoretically related to Silvia’s (2005a) appraisal approach; appraisals of novelty resembling instantiations of disfluent automatic processing, and appraisals of coping potential corresponding to meta-cognitive experience of disfluency reduction.

Moreover, our results tentatively suggest that the controlled and the automatic processing of a stimulus may proceed simultaneously, and that they may interact. That is, if disfluency reduction is experienced during controlled processing when the initial automatic processing has been disfluent, automatic processing fluency will also increase. In fact, this finding is in line with research showing that repeated processing of a disfluent stimulus may eventually lead people experience immediate pleasure-based liking of a stimulus (see Landwehr et al., 2013). Importantly, simultaneous automatic and controlled processing would imply that pleasure and interest may be experienced concurrently. In this sense, the interesting question of how these two responses merge into an overall aesthetic response (e.g., aesthetic liking) arises.

We introduced epistemic processing goals as moderating the processing style, and we showed that an epistemic goal of knowledge expansion, rather than one of knowledge preservation, activates the controlled processing of a stimulus. From our perspective, future research should investigate the construct epistemic processing goal in more
detail, in particular what determinants the one or the other epistemic goal.

This research also offers practical implications for the management of aesthetic preferences. Our results suggest that for an optimization of aesthetic impressions, the fluency with which the stimulus can be processed, and a perceiver’s epistemic processing goal (i.e., more generally the processing style) need to be considered conjointly. Importantly, epistemic processing goals should vary depending on the type of aesthetic stimulus. That is, because the epistemic processing goal with which a perceiver is likely to approach a target should be different for product design (knowledge preservation) than for a piece of contemporary art (knowledge expansion), the recommended level of stimulus fluency differs. Reversing the argument, one may assume that stimuli that evoke interest should be more likely perceived as art, whereas stimuli that elicit pleasure should be more likely perceived as product design.

Overall, our findings make emphasis to differentiate between pleasure and interest when studying aesthetic preferences. Specifically, we showed that judgments of interest can fall apart fundamentally from judgments of pleasure for the same stimuli, depending on perceivers’ processing style. In fact, this breakup of pleasure and interest may explain why previous research on the relationship between pleasure and liking was partially inconsistent.

By explaining the two most prominent aesthetic responses—pleasure and interest—based on processing dynamics and processing style, this research provides a theoretically coherent framework for explaining more generic positive aesthetic responses such as aesthetic liking. We believe that this framework can radically inform theoretical and empirical research on aesthetic preferences, and we propose to term it the Pleasure-Interest Model of Aesthetic Liking (PIA Model) (Graf & Landwehr, 2014).

References

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Abstract
This paper discusses trends in empirical aesthetics by systematically reviewing the journal of Empirical Studies of the Arts from the first issue in 1983 to 2013. In order to grasp the distribution of art divisions, the diverse approaches, and methods involved in empirical aesthetics, 382 articles were examined in the following three categories: Art Domains, Topics, and Methods. In a second step all 34 music-related papers were reviewed in terms of study design, subjects, stimuli, analytical methods, results, and their relation to the field of empirical aesthetics. Based on this, distributions and trends within the journal were identified and judgments about their relation to empirical aesthetics with special emphasis on music were made.

Keywords: systematic review; empirical aesthetics; trend analysis; empirical musicology

Introduction
From its beginnings in the late 19th century, empirical aesthetics has emerged as an interdisciplinary research field in which various approaches from areas such as philosophy, psychology, and art-related studies come together (e.g., Martindale, 2007, for an overview).

Following Fechner’s (1876) first attempts to empirically ground a philosophical discipline, empirical aesthetics, or aesthetics “von unten”, evolved as a new research domain in early 20th century. Despite this vivid interest in the early stages, the importance of empirical aesthetics declined in importance for psychologists, art experts, and philosophers and remained more or less untouched for about two decades. It was not until the 1960s when psychologists and behavioral scientists such as Daniel Berlyne (1960) and other researchers at the University of Toronto revived the discipline (Berlyne, 1971, 1974). In 1965 the International Association for Empirical Aesthetics (IAEA) was founded and the American Psychological Association began to take more interest in aesthetics. Despite the growing interest that emerged in psychology, empirical aesthetics remained more or less neglected in the arts and humanities. Apparently, this might be due to the general incompatibility of “the two cultures” addressed by Snow (1959), whereby academics from the humanities are incapable of communicating with researchers from the sciences and vice versa. Another commonly proposed critique that might have had an influence on the development of empirical aesthetics may be the artificiality and lack of ecological validity within experimental conditions, which do not suffice for real art experiences and events.

In order to bridge the gap between the two academic spheres, interdisciplinary collaboration and approaches seem to be required. Institutions such as the “National Center of Competence in Research – Affective Sciences” in Geneva or the interdisciplinary research center “Languages of Emotion” in Berlin, do not only contribute to the interdisciplinary constitution of the field, but also prove this collaboration to be rewarding. However, one objective of empirical aesthetics remains defining itself as a unitary discipline.

This paper seeks to contribute to a sense of domain-understanding by reviewing the articles that have been published in Empirical Studies of the Arts (ESA) from the first issue in 1983 to 2013. Our approach is inspired by a study conducted by Tirovolas and Levitin (2011), who systematically reviewed the journal Music Perception in order to examine recent trends in the cognitive studies of music.

In addition to the review of general trends in empirical aesthetics, a more exhaustive examination of music-related papers was conducted. Our motivation for this can be explained by our general research interest as members of the music department of the newly founded Max Planck Institute for Empirical Aesthetics in Frankfurt am Main (Germany) and the interdisciplinary research center “Languages of Emotion” in Berlin, do not only contribute to the interdisciplinary constitution of the field, but also prove this collaboration to be rewarding. However, one objective of empirical aesthetics remains defining itself as a unitary discipline.

Our general aim was to capture the width of research questions and approaches published in the ESA journal. To this end, every article with an available abstract on the website of the international association of empirical aesthetics was included (http://www.science-of-aesthetics.org/journal.html). Prefaces, introductions to special issues, editorials and obituaries were not taken into account, since they were not within the scope of our interest at the beginning of our quest. Consequently, 382 articles (93%) out of a possible 410 articles were coded, ranging from Vol. 1, Issue 1 (1983) to Vol. 31, Issue 2 (2013), the cut-off date for the present article. Based on this procedure, the present article...

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27 We are aware that these sections may also contain important information about the underlying self-conception of the journal and the IAEA respectively. Therefore we plan to analyze these texts in a next step.
was twofold: In a first step all abstracts were coded in three categories whereby in a second step all 34 music-related papers were reviewed in full length.

**First Step**

In the first step the abstracts of all 382 articles were examined for, on average, 10-15 minutes each, and coded for specific features in each of the following three categories: Art Domains, Topics, and Methods. To get a clear distribution of the Art Domains, no double nomination was allowed. Following this strict predefinition all articles were marked, if they were difficult to classify. Due to the diversity of research questions, multiple nominations were allowed for Topics and Methods. Because some of the abstracts could not be sufficiently coded to an art domain, we added three additional domains: Theory, Creativity, and Ethnology. Full lists of the codes and their definitions are provided in Tables 1, 2, and 3, p.5. Additional information on authorship, date of publication and length was also collected.

**Second Step**

In the second step the focus was on the 34 music-related papers. For this, a more holistic approach was employed in order to get a wide array of information and include everything that might have been overlooked by a rigid categorial coding. The applied method was inspired by qualitative content analysis (Mayring, 2010). Three coders examined all papers in full length. Afterwards the following codes were developed in a group discussion: Study Design, Subjects/Cases, Stimuli and Stimuli Presentation, Analytical Methods, Results, and Institutional Affiliation of the Author. The aim here was to capture the frequency of the codes as well as the content, i.e. which stimuli or methods were employed. Additionally, information about the implicit definition of empirical aesthetics was extracted.

**Results**

**First Step**

At first, the distributions of the coded categories were calculated. Figure 1 illustrates overall percentages of the coded features within the Art Domains. The four most frequent domains studied were found to be: Fine Arts (26%), Paintings (20%), Poetry & Drama (9%), and Music (9%). Furthermore the four most examined Topics were Aesthetic Judgment (52%), Perception & Cognition (39%), Stimulus (32%), and Emotion (15%). For a detailed illustration of all coded topics see Figure 2. Within the Methods-category the four most frequently used methods were: Survey (54%), Rating (41%), Experiment (40%), and Observation (36%). Figure 3 gives a precise presentation of all methods coded in this category. Note that for the categories Topics and Methods the totals exceed 100%. This is due to the multiple classifications within these categories.

![Figure 1: Distribution of Art Domains from 1983-2013](image1)

![Figure 2: Distribution of Topics from 1983-2013](image2)

![Figure 3: Distribution of Methods from 1983-2013](image3)
To examine the development of the features within the different categories over time, regression analyses were conducted on all category codes, with “Year” as the predictor variable. According to Tirovolas and Levitin (2011) the criteria for considering a trend as significant was that the particular β value (the slope of the regression line) must be significant (α = .05). Figures 4-6 illustrate the overall trends within each category from 1983 to 2013. The solid lines mark the significant (p ≤ .05) and the almost significant (p ≤ .10) trends. For those features the β value is specified in the legend as well.

Two of the art domains yielded regression lines with significant beta values. Both were downward trends, Poetry & Drama (β = -.38, p < .05) and Ethnology (β = -.20, p < .01). Nevertheless, the percentage of annual published articles appears to be on a fairly low level in each of both domains (Fig. 4). Two domains yielded almost significant regression lines with clear upward trends, Fine Arts (β = .53, p = .089) and Paintings (β = .46, p = .086).

Within the Topics-category only one downward trend emerged for Historical (β = -.39, p < .05) and one regression line also indicating a downward trend neared significance, Comparative (β = -.21, p = .069).

In the Methods-category we observed 3 trends: a decrease in the use of Content Analysis (β = -1.27, p < .001) and an increase in the use of Surveys (β = 1.0, p < .05) and Ratings (β = .92, p < .01). Furthermore we found one almost significant trend for the decreasing use of Computational methods (β = -.19, p = .095).

We also examined the number of authors and their frequency of contribution. For this calculation we also included the authors of the special issue dedicated to Martindale (Volume 27 Issue 2) for which no abstracts were available online. Within the last 30 years 521 different authors contributed to the journal. 88 (17%) authors published more than one article and 39 (8%) authors published more than 2 articles in ESA. Table 4 shows the absolute numbers for the different types of authors.

Table 4: Absolute Numbers of Contributing Authors within the ESA from 1983-2013.

<table>
<thead>
<tr>
<th>Type of Author</th>
<th>Total Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Authors</td>
<td>521</td>
</tr>
<tr>
<td>Lead Author</td>
<td>277</td>
</tr>
<tr>
<td>Second Author</td>
<td>175</td>
</tr>
<tr>
<td>Third Author</td>
<td>75</td>
</tr>
<tr>
<td>Fourth Author</td>
<td>25</td>
</tr>
<tr>
<td>Fifth Author</td>
<td>6</td>
</tr>
<tr>
<td>Sixth Author</td>
<td>2</td>
</tr>
</tbody>
</table>

Finally, we also tracked the names of the authors. Table 5 shows all authors who published more than 5 articles in the journal. For this calculation all authorships were calculated together.

Table 5: Authors who published more than 5 Articles within the ESA from 1983-2013.

<table>
<thead>
<tr>
<th>Name of Author</th>
<th>Number of published Articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cupchik, G. C.</td>
<td>11</td>
</tr>
<tr>
<td>Simonton, D. K.</td>
<td>11</td>
</tr>
<tr>
<td>Silvia, P. J.</td>
<td>9</td>
</tr>
<tr>
<td>Martindale, C.</td>
<td>7</td>
</tr>
<tr>
<td>Bonaiuto, P.</td>
<td>6</td>
</tr>
<tr>
<td>Holbrook, M. B.</td>
<td>6</td>
</tr>
<tr>
<td>Kozbelt, A.</td>
<td>6</td>
</tr>
<tr>
<td>Locher, P.</td>
<td>6</td>
</tr>
</tbody>
</table>

Interestingly, most of these authors are former presidents of the IAEA: Cupchik (1990-94), Simonton (1998-2000), Martindale (1994-98), Bonaiuto (2000-04), and Locher (2004-08).

Second Step

The analysis of the music-related papers revealed a clear predominance of experiments, concerning setup and design of the studies, which made up almost one half (44%). Questionnaire surveys, scale evaluations, content analyses, essays and reviews followed. In most cases the involved subjects were students (38%), although four of the music-related studies dealt with musicians. The sample sizes ranged from 32 to 260 subjects (M = 82, Mdn = 64). About one third (32%) of the studies contained no musical stimuli. From the ones that did, most of them used real music from a wide range (e.g., Mozart’s Piano Sonata No. 10 in C major, 330, Pachelbel’s Canon and Gigue for 3 violins and basso continuo, Beethoven’s Piano Sonata in C-sharp minor “Quasi una fantasia” Op. 27, No. 2, or John Coltrane’s “Some Other Blues” On Coltrane Jazz 1961). Only some of them (9%) used MIDI-generated sounds.

Two of the papers did not employ any analytical methods, meaning that the vast majority (94%) made use of statistical techniques. There was a great variety in the methods applied: ANOVA/MANOVA was most common (32%), followed by correlation, factor analysis, MDS and MDA, historiometric-, spectral-, and path-analysis. The exhaustive application of statistical methods is well reflected in the distribution of the institutional affiliation of the authors: Psychology was predominant (59%), followed by Marketing and Consumer research (18%), whereas musicologists only authored four (12%) of the music-related papers.

Concerning the implicit definition of empirical aesthetics, two fairly stable aspects emerged: first empirical aesthetics mainly addresses one of the classical questions or concepts of philosophical aesthetics, namely the examination of the relation between objective features of an artwork (or stimulus) and the subjective perceptual responses towards it, and second, it is thought of as dealing with the recipient’s preference and/or liking of aesthetic objects and therefore mainly focuses on evaluative judgments.
Discussion

This paper represents only a subset of analyses that could be calculated from our data. Nevertheless some remarkable aspects emerged.

An obvious finding within the category of studied Art Domains is the clear predominance of visual arts: Nearly half of the papers in the ESA (46%) studied aesthetic phenomena in Fine Arts (26%) and Paintings (20%). Furthermore the regression analysis yielded two almost significant upward trends of these two domains, indicating that this disparity even got stronger over time. The second most studied domain is Poetry & Drama (9%). For this domain a significant downward trend was found denoting a continuously declining interest in the past 30 years. Even if Music received more or less constant attention, the overall percentage of papers studying Music (9%) was quite small. In defining empirical aesthetics as a comprehensive research field including all sorts of arts, this imbalance seems striking, although it might be symptomatic of the general development of research within the field of empirical aesthetics.

The distribution of Topics within the whole journal does not show any exceptional findings or trends. With Aesthetic Judgment as the most included topic in all papers followed by Perception & Cognition these findings could be anticipated. Only a weak downward-trend for studying historical topics could be found while comparative approaches also showed a decrease over time.

The significant increase and overall dominance of the use of Surveys and Ratings is in line with the findings of Aesthetic Judgment being studied most often. The use of Experiments and Observations seemed to be equal. An interesting result is the significant decrease of the use of Content Analysis (Fig. 6). This might be associated with the decrease of Stimulus related topics (even though this decrease is not significant).

Considering the analysis of the music-related papers, the impression of another imbalance became apparent: Not only does music seem to be underrepresented in the journal, but also within the music-related papers, a clear lack of authors with a distinct musicological background was identified. Considering the fact that musicologists represent the experts in this art-domain, a lack of their expertise in music, might bias the research on the aesthetic dimension of music.

With most studies conducted by psychologists, it seems to be evident that methods from the general field of psychology have emerged into empirical aesthetics (e.g., Martindale, 2007), meaning that empirical aesthetics as well as music psychology is most widely understood as a research domain within the field of psychology. Vice versa research methods and findings from empirical aesthetics are only rarely adopted within the field of general psychology (e.g., Högé, 2013).

The understanding of empirical aesthetics as emerging from the analysis of the music-related papers, which try to investigate the relation between objective features of stimuli and the responses of subjects, further strengthens the need for a genuine interdisciplinary approach. By this narrow understanding several aspects (i.e., situational, individual, contextual) that influence aesthetic appreciation are neglected (see reciprocal feedback model of musical response from Hargreaves, Miell, and MacDonald, 2005). Further, the unique quality of aesthetic appreciation has been discussed since antiquity, and various accounts of music and aesthetics are under discussion in musicology. Introducing aspects of this discussion into the field of empirical aesthetics might be beneficial for the understanding of aesthetic concepts but also to the understanding of how music is related to them.

Nevertheless, the papers under examination offer several benefits for the discipline of empirical aesthetics. One of them is the development and testing of new methods, ranging from computational content analyses to historiometrics, including recent approaches in social sciences and psychology. Moreover, the evaluation of measurements and scales that capture the unique quality of aesthetic appreciation represents valuable and needed research, which will hopefully be recognized in both of the two cultures.

Acknowledgments

The authors are thankful to Myra Huymayer and Salvatore Tati regarding their support with the coding and editing our data set.

References

### Table 1: Art Domains Code Definitions.

<table>
<thead>
<tr>
<th>Code</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Music</td>
<td>Studies that examine the aesthetic appreciation of music, musical preferences, or the production of music.</td>
</tr>
<tr>
<td>Fine Arts</td>
<td>Studies that examine general aspects of aesthetic appreciation of visual stimuli, including Phenomena such as the golden section, or basic color perception.</td>
</tr>
<tr>
<td>Paintings</td>
<td>Studies that examine the specific aesthetic appreciation of paintings.</td>
</tr>
<tr>
<td>Sculpture &amp; Craftwork</td>
<td>Studies that examine aesthetic appreciation and/or production of sculptures and craftwork.</td>
</tr>
<tr>
<td>Literature &amp; Language</td>
<td>Studies that examine general aspects of aesthetic appreciation of language related stimuli, or corpus related aesthetics.</td>
</tr>
<tr>
<td>Poetry &amp; Drama</td>
<td>Studies that examine the specific aesthetic appreciation of literature that in most cases emphasizes rhyme, verse and meter.</td>
</tr>
<tr>
<td>Prose</td>
<td>Studies that examine the aesthetic appreciation of prose.</td>
</tr>
<tr>
<td>Film</td>
<td>Studies that examine the aesthetic appreciation and/or production of film.</td>
</tr>
<tr>
<td>Theory</td>
<td>Studies that examine aesthetics from a philosophical and/or theoretical standpoint.</td>
</tr>
<tr>
<td>Dance</td>
<td>Studies that examine the aesthetic appreciation of dance.</td>
</tr>
<tr>
<td>Creativity</td>
<td>Studies that examine creativity in aesthetics.</td>
</tr>
<tr>
<td>Ethnology</td>
<td>Studies that examine aesthetic questions from an ethnological standpoint.</td>
</tr>
</tbody>
</table>

### Table 2: Topics Code Definitions.

<table>
<thead>
<tr>
<th>Code</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perception &amp; Cognition</td>
<td>Studies that involve any aspects of perception and cognition, such as the processing of any aesthetic stimuli.</td>
</tr>
<tr>
<td>Emotion</td>
<td>Studies that involve any aspects of emotion elicited by aesthetic stimuli.</td>
</tr>
<tr>
<td>Aesthetic Judgment</td>
<td>Studies that involve any aspects of aesthetic judgment, appreciation or liking.</td>
</tr>
<tr>
<td>Neuroscience</td>
<td>Studies that involve any aspects of neurosciences or which focus on the neuronal processing of aesthetic stimuli.</td>
</tr>
<tr>
<td>Transfer-Effect</td>
<td>Studies that involve any aspects of transfer effects (e.g. enhancement of cognitive abilities through music listening).</td>
</tr>
<tr>
<td>Comparative</td>
<td>Studies that involve any aspects of comparative studies, such as cultural, crossmodal, or intramodal comparative studies.</td>
</tr>
<tr>
<td>Memory</td>
<td>Studies that involve any aspects of memory, memory processing, recollection, and remembrance.</td>
</tr>
<tr>
<td>Stimulus</td>
<td>Studies that involve any aspects of stimulus composition and/or stimulus analysis procedures.</td>
</tr>
<tr>
<td>Historical</td>
<td>Studies that employ any historical perspective on aesthetic phenomena or that involve any historical questions of aesthetics.</td>
</tr>
</tbody>
</table>

### Table 3: Methods Code Definitions.

<table>
<thead>
<tr>
<th>Code</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment</td>
<td>Studies that involve an experimental design and are primarily focused on hypothesis testing.</td>
</tr>
<tr>
<td>Observation</td>
<td>Studies that involve observational data collection.</td>
</tr>
<tr>
<td>Survey</td>
<td>Studies that involve any kind of survey or questionnaire.</td>
</tr>
<tr>
<td>Rating</td>
<td>Studies that involve ratings, e.g. of aesthetic appreciation or liking of aesthetic stimuli.</td>
</tr>
<tr>
<td>Content Analysis</td>
<td>Studies that involve content analytical methods and are either based on text corpora or on the analysis of stimuli.</td>
</tr>
<tr>
<td>Behavioral</td>
<td>Studies that involve behavioral measures.</td>
</tr>
<tr>
<td>Physiological</td>
<td>Studies that involve physiological measures such as heart rate variability or skin conductance.</td>
</tr>
<tr>
<td>Computational</td>
<td>Studies that involve computational methods.</td>
</tr>
<tr>
<td>Interview</td>
<td>Studies that involve any interview techniques, e.g. in-depth or narrative interviews.</td>
</tr>
</tbody>
</table>
Figure 4: Trends in ESA between 1983 and 2013 for studied Art Domains

Figure 5: Trends in ESA between 1983 and 2013 for studied Topics

Figure 6: Trends in ESA between 1983 and 2013 for used Methods
What I Talk About When I Talk About Aesthetics

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Abstract

In this paper I will argue that scholars of aesthetics rarely define what they mean when they talk about aesthetics. I will describe three of the most common conceptualizations and argue that only one of them allows us to speak of aesthetics or aesthetic pleasure for product designs and other non-artistic artifacts. I will further propose three sources of aesthetic pleasure that apply to all human artifacts: formal, relative, and intentional aesthetics. Together these sources define a unified model of aesthetics.

Keywords: Aesthetics; aesthetic pleasure; artifacts.

Introduction

Recently, at a design research conference in Umeå, Sweden, I met Lars Folkman, an academic from the department of Design and Communication at the University of Southern Denmark. Lars recently published a book on aesthetics, “The Aesthetics of Imagination in Design”, and I told him I was looking forward to reading it. Since I am doing research in empirical aesthetics for over twenty years, I thought our work must have a lot in common. Surprisingly it didn’t. Although, on the surface, our work seems to have a similar goal, i.e., understanding the aesthetic experience towards designed artifacts, in practice we work in completely different research traditions, each with their own concepts and theoretical models. We were talking about completely different types of aesthetics.

What is Aesthetic?

Whenever scholars talk about aesthetics or aesthetic pleasure, they are notoriously bad in specifying what they are actually looking at. This is troublesome because the concept of aesthetics can refer to different things, both in everyday language and in academic texts. Roughly, we can at least separate three different ways in which the adjective ‘aesthetic’ is commonly used:

1. ‘Aesthetic’ in terms of ‘how things look’ or ‘the care that has been given to its appearance’, often in contrast to an objects’ functioning. Think for example of expressions such as “aesthetic properties”, “Japanese aesthetics”, or “the aesthetics of automobiles”. Here aesthetic(s) is almost used as similar to design or ‘form giving’.

2. ‘Aesthetic’ with respect to works of art or dealing with artistic material. This is the most common use of the term and can be found in phrases such as “philosophical aesthetics”, “the aesthetic process”, or “the aesthetic experience of a Van Gogh”. In these applications, aesthetic can refer to both properties of artworks as well as any type of response people can have towards works of art.

3 ‘Aesthetic’ to indicate a special type of response that people can have to both man-made objects and natural scenes. It is the kind of response that should be contrasted to a more utilitarian response and is often regarded as purposeless (Kant, 1952) and distanced (Bullough, 1912). We tend to describe this response in terms of ‘direct pleasure’ (Dutton, 2009), liking, appreciation, or beauty, as in “I aesthetically prefer this chair”, “landscape aesthetics”, or “a beautiful idea”.

To avoid misunderstanding and confusion among scholars of aesthetics, I would very much recommend them to always and clearly indicate in what sense they talk of aesthetics. Take for instance the often cited ‘aesthetic process model’ of Leder, Belke, Oeberst and Augustin (2004). This model carefully and adequately describes how people process a work of art and what the outcomes of this processing can be. ‘Aesthetic’ in this context thus refers to the second type proposed here, i.e. in the sense of dealing with artworks, and the processes and responses described are much more elaborate than accounted for by the third notion of aesthetics. If one adopts this latter notion, the model makes only limited sense: only those parts of the model that deal with aesthetic pleasure as such would then be relevant.

The beauty of this third conception of aesthetics is that it allows us to speak of aesthetic responses to any stimulus, man-made or natural, physical or mental, morally laudable or loathsome. It allows us to talk about beautiful watches and nail clippers, a beautiful goal in a football match (van Persie!), a beautiful girl or gesture, and a beautiful experiment in science (e.g. Crease, 2003), a beautiful robbery and a beautiful death. This third type of use therefore makes most sense in the context of “everyday aesthetics” (Saito, 2007) in that it acknowledges the fact that we can have aesthetic responses towards any kind of stimulus, including all types of human artifacts.

Aesthetic Pleasure

Aesthetics, or more precisely aesthetic pleasure is the kind of pleasurable response people obtain from perceiving and understanding things in the world around them. It is the pleasure people derive from processing the object for its own sake, “as a source of immediate experiential pleasure in itself, and not essentially for its utility in producing something else that is either useful or pleasurable” (Dutton, 2009, p. 52). That does not mean that aesthetic laws or principles equally apply to all domains. To understand such pleasure, each domain has its own inherent logic (e.g., Thornhill, 2003) and one could not simply transfer principles from one domain to the other. In other words, what makes female faces beautiful to look at, i.e., features that signal health and fertility, is grounded in different rules than people’s aesthetic preference for e.g. landscapes or designed artifacts. Here, we will confine ourselves to this latter category: what makes human
artifacts pleasurable to perceive and comprehend? This is the type of aesthetic pleasure that is most intensively studied in empirical aesthetics.

These human artifacts can be of any kind: products, buildings, and works of art, but also gardens, meals, organizations, and ideas. What all of these artifacts have in common is that they have been ‘designed’, purposively constructed to serve a particular instrumental (e.g. shelter, nutrition) or experiential (e.g. admiration, fun) goal. I will argue that part of their aesthetic quality resides in this purposefulness. The very fact that people can aesthetically appreciate the way in which an artifact can fulfill its purpose does however not mean that the response is interested; an elegantly functioning engine can aesthetically please us without aiming to ride the motorbike. What all artifacts also have in common is that they have properties and these properties have mutual relationships. As a result, they can exhibit harmony or balance, unity and/or variety, order and/or complexity. And finally, when confronted with an artifact we immediately tend to compare it to other, like artifacts. In that respect, they can appear to be familiar or typical of their kind, or very novel or even innovative.

Three Sources of Aesthetic Pleasure

Elsewhere (Hekkert, 2014), I have proposed an evolutionary framework to explain what makes artifacts pleasurable at different levels of processing. At all levels, the pleasure people derive from (designed) artifacts involves a balance between two opposing forces that are rooted in our needs for safety and accomplishment. “On the one hand, humans seek that which is safe to approach, offers security, and makes little demand on their limited processing capacity. On the other hand, humans are motivated to take risks, engage in exploratory behaviour, extend their capabilities, and promote their learning.” (Hekkert, 2014, p. 281). The two poles or opposing forces at each level of processing are all concerned with the way something is done, i.e. with the “how”. Artifact aesthetics therefore deals with organization, with seeing relationships; with how the intention is translated into a solution, how the result relates to other (previous) results of a similar kind, and how the object properties are organized.

Formal Aesthetics

Artifacts consist of properties and often these properties are given: the materials and colors in a painting, the formal and functional elements in a car dashboard or web page, the parameters of a formula. Roughness of materials or variety in elements is inevitable and it’s the task of the artist/designer to bring smoothness or order in this inherent complexity. Aesthetic pleasure is arrived at when the designer allows maximum variety or naturalness whilst establishing an optimum of unity, regularity, smoothness or organization. Hence, we like unity-in-variety, smooth finishing of natural materials, good proportion and natural organization. We aesthetically appreciate an abundance of flowers, but only if they are brought to a balanced whole. We appreciate control over the elements.

Relative Aesthetics

Artifacts are never perceived in isolation. As soon as we see something, we compare it to other instances of the (assumed) same family or category. Artists and designers always strive for novelty or innovation, to overcome repetition or copying and to outdo their predecessors. Albeit, to a limited extend. Too much divergence or too much novelty prevents assimilation and comprehension. For that reason, artists and designers should strike a balance between novelty and familiarity, a trade-off also known as Most Advanced, Yet Acceptable (MAYA). This relative position of artifacts is not restricted to the domain of objects: Artifacts play an important part in the social world and are often associated with use contexts and particular users. Here we can assume a similar trade-off between safety, i.e. inclusion or conformity, and accomplishment, i.e. uniqueness or autonomy. In analogy with MAYA, we predict that objects that offer maximum autonomy, yet preserve connectedness (to a group of significant others) are aesthetically preferred.

Intentional Aesthetics

Finally, artifacts are a means to an end. Whenever we are confronted with an artifact we take a ‘design stance’ and assume an underlying idea or intention. We may have foreknowledge of this intention, get it from the instruction manual or display next to the artwork, or infer it from what we see. Whatever the source, the intention allows us to appraise the object in its light: To what extend did the maker realize what was intended? We may disapprove of the intention (e.g. a murder), but we can still appreciate the way the intention was effectuated. Was it done properly, efficiently, elegantly, or economically? The most plausible candidate for capturing the aesthetic quality of this relationship is the principle of Maximum Effect for Minimal Means. We aesthetically prefer those works of art, designed objects, mathematical proofs and chess moves that require relatively few means (i.e. energy, parameters, elements) to attain a relatively large effect (i.e. goal, explanation, performance).

Aesthetics in Interaction

The three types of aesthetic processing as proposed here do not only apply to artifacts as objects for admiration and contemplation in a passive sense. Some artifacts, such as products, demand to be touched and used and this interaction can be pleasing for different reasons, but along similar lines. First, the interaction can be aesthetically pleasing in terms of its interaction properties (Diefenbach, Lenz, & Hassenzahl, 2013); we like the smooth, uninterrupted and elegant way in which we exert force upon a cork to open the wine bottle. Secondly, a particular corkscrew can perform its task in a novel yet familiar fashion and therefore be appreciatively appreciated. And finally, the way in which a corkscrew allows you to open a bottle can be appropriate for the need that was intentionally embodied in the device (e.g. quick, professional, showing off). There is every reason to believe
that the same set of balancing forces explain the aesthetic pleasure we derive from interacting with things.

**Conclusion**

Recently, Bullot and Reber (2013) proposed a psycho-historical framework of art appreciation. Their three modes of appreciation, i.e. basic exposure, artistic design stance, and artistic understanding, show much similarity to the three sources presented here. The latter two modes/sources acknowledge the importance of considering the social/cultural context and intention in appraising an artifact. The intentional stance is needed to explain why a mathematical proof, a simple appliance, and an organization can be considered beautiful. But it also explains why aesthetics or beauty is as relevant to contemporary, abstract and conceptual art as it has always been to representational art. Some works of art may certainly not be regarded as beautiful in a formal sense, but as a means to a conceptual intention, they could be aesthetically very pleasing. Each of the three sources lead to a range of aesthetic principles and predictions and many of these are currently tested with all kinds of designed products, from car keys to corkscrews. Together they define a unified model of aesthetics.

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**References**


Picasso’s Expressive Use of Color in Paintings

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Abstract

Four raters untrained in art observed a corpus of images of Picasso’s paintings on a website and gave emotional descriptions for 261 images of paintings. The frequency of emotion words used to describe paintings in each decade between 1895 and 1972 was correlated with the frequency of the use of color in each decade of paintings. There were a few commonalities among raters’ correlations between color and emotion, but there were many individual variations in the associations. Color-emotion associations did not show the same pattern as previous findings with drawing and coloring tasks. It is suggested that viewing art works involves conceptual processes beyond those seen in basic color-emotion associations.

Keywords: color; emotion; paintings; Picasso

Introduction

How do we look at artworks? To answer this question Vartarian and Skov (2014) included 15 studies involving 8 to 87 participants in a meta-analysis of the neural correlates of viewing paintings found in functional magnetic resonance imaging. A distributed system involving processing of perception, emotion and cognition emerged from an activation likelihood estimation methodology. It will be no surprise to anyone who has experienced an emotional reaction to an art work that the processes of perception, emotion and cognition are intimately connected while viewing paintings and images. The science of neuroaesthetics serves to explain how this happens in the human brain. Chatterjee (2003, 2010) and Leder, Belke, Oeberst & Augustin (2004) suggest models of parallel and hierarchical processes in the aesthetic experience. Locher, Krupinski, Mello-Thoms & Nodine (2007) have found support for the latter model in a study of eye movements in the first moments of viewing images of paintings, suggesting that initial processing of the gist of a painting occurs even before the first saccade away from the central portion of the image. Taken together, these data reveal that the aesthetic reaction to an image is immediate and widely distributed in perceptual, cognitive and emotional systems. The suggestion, then that color and emotion might be automatically associated in an aesthetic experience does not seem far-fetched.

Natural associations between the senses have been found in infants and adults (Maurer, Gibson & Spector, 2013). The thesis that all infants show evidence of synesthesia that is eventually lost in adulthood through pruning of connections in the developing brain as a result of experience has also been developed by Simner (2013). Early associations between colors and numbers or letters, for example appear to be explicit, as in synesthesia, in infants while in nonsynaesthete adults these remain as implicit associations of a similar kind. Toddlers show typical associations (for example X and Z with black, I and O with white) as do adult synaesthetes, and remnants of these are also seen in other adults. These associations cannot be explained by learning. We would suggest, then, that specific color-emotion associations found in many studies of drawing, painting and coloring, (see Humphrey, Rivas & Hermsen, 2013) may not be the result of learning per se but may be related to a natural bias toward specific associations of an implicit nature.

Materials

Images of paintings from website URL: http://picasso-paris.videomuseum.fr/Navigart/index.php?db=picasso&qs=1 were observed by five raters. Two raters catalogued colours and four raters gave emotion descriptors for the painting images.

Procedure

Images were catalogued for use of color by two independent raters. Only categories showing 100% agreement were used in the analyses.
Four independent judges, one male and three female, with no formal art training viewed images and named the emotions expressed by the figures in the paintings. Three judges gave responses for all 261 images. One female judge gave responses for 148 paintings made between 1895 and 1936.

Analyses

Frequencies of colors used and of emotions named by each of the four judges in each decade of paintings from 1895 to 1972 were calculated. Correlations of frequency of emotion names and frequency of colors used by decade were calculated using correlation procedures in Microsoft Excel (CORREL). Positive correlations greater than .2 are reported here. Anger was correlated with purple (.64), surprise with grey (.43) blue (.32) and brown (.32), happiness with purple (.74) blue (.37) grey (.35) and yellow (.25), disgust with purple (.75), sadness with purple (.81) and blue (.29) fear with purple (.70), and grey (.31), embarrassment with purple (.67), love with purple (.47) grey (.45) and blue (.39), pride with brown (.65) purple (.43) grey (.42) blue (.42) and white (.32), guilt with brown (.54) grey (.47) and blue (.39) and empathy with grey (.25) and purple (.24). These correlations did not reveal associations similar to those found previously between colors and emotions.

We then asked whether individual raters showed similar patterns of associating colors with emotions in the paintings. Correlations for individual raters showed some variation. For red three raters showed no correlated emotions and one showed correlations with pride and empathy. For orange one rater showed no correlations and others showed correlations with embarrassment, pride and empathy.

For yellow raters showed correlations with surprise, happiness, embarrassment, love, pride, guilt, disgust, sadness and fear, but these differed across raters. Likewise for brown correlations differed across raters showing correlations with happiness, pride, guilt, anger, sadness, empathy, love, surprise and fear. For green three raters who viewed all of the paintings showed correlations with love but also variously with happiness, embarrassment, pride, guilt, anger, disgust and empathy. Blue was correlated with happiness and sadness for three raters but also variously with anger, surprise, embarrassment, love, empathy, and fear. Purple was consistently correlated for three raters with anger but also with happiness, disgust, sadness, fear, love, and empathy. Grey was correlated with surprise, happiness and sadness for three raters but also with anger, embarrassment, pride, guilt, empathy, fear and love for some. Black was consistently correlated for three raters with anger but also with embarrassment, love, disgust, pride and empathy for some. White was always correlated for three raters with sadness, but also with embarrassment, empathy surprise and pride.

Discussion

The corpus of paintings viewed by the raters on a website showed a range of colors used and a range of emotions portrayed. But some colors and emotions were more prevalent than others. Raters commented on the limited range of emotions portrayed and often used words other than those analyzed here to describe the images. Indeed, some commented on the lack of emotion in the paintings, particularly in the characters portrayed in the paintings. It was observed that colors seem to bleed between figures and background giving an “uneasy” quality to the images. Not surprisingly, then, Picasso’s use of color does not provide a one-to-one coding of emotion, but requires some conceptual insight on the part of the viewer.

The nature of color-emotion associations while viewing works of art may be related to “naturally-biased” associations (Maurer at al, 2013) as seen in in tasks of coloring and naming colors in association with emotion words (Humphrey et. al., 2013). The four raters in the present study, however, showed associations beyond these basic mappings. Color-emotion associations may be like synaesthetic mappings where emotion is the inducer and color the concurrent (in the terminology of Simner, 2013) so that emotion categories induce color associations, but the reverse is not necessarily true. Looking at red does not induce anger, but thinking about anger is most likely to induce red. Looking at art works, then, requires processing that goes beyond perception-emotion associations and requires conceptual, cognitive processing as seen in Leder et. al.’s (2004) model of neuroaesthetics.

It is important to recognize that colors look very different when viewing the art work in person than when viewing images produced electronically. It will be necessary to replicate the present results with paintings viewed in person. The Musee National Picasso is currently closed and many of the original works discussed here are not available. As these works become available we will view them in their natural state. It will also be important to keep in mind that colors will look different under different lighting conditions. A study of differences in emotions perceived in paintings under different viewing conditions will be informative and have important implications for the presentation of art works in public spaces and in various media.

A more detailed analysis of specific paintings and their formal characteristics as related to the use of color will reveal how paintings portray emotion for the observer. Specific observers will have differing responses to works of art, perhaps depending on art training or cultural background. It will be necessary to sort out the role of experience from those universals of perception that allow us all to see the same meaning in a painting by having individuals with differing training and cultural backgrounds rating paintings. Those automatic perceptual processes which show natural biases toward specific associations will be influenced by higher cognitive processes that might be more culturally influenced.
On the other hand, it is also possible that specific training in art can strip away the more conscious processes and reveal the more basic perceptual processes. Just as artists can be trained to produce perspective in visual images, the implicit meaning of other specific formal characteristics such as color to convey emotion might emerge from experience with art.

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Rerouting Facial Perception – the Role of Prosopagnosia in Chuck Close’s Portrait Art

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Abstract
The contradiction of the contemporary portrait painter Chuck Close having developmental prosopagnosia (DP) presents an unusual opportunity for a neuroaesthetic examination of an artist whose chosen subject matter centers on his deficit. While some interpretations have stressed Close’s strategies at mitigating his face blindness - they fail to explain how key aspects of his art, such as their enormous scale, featureless backgrounds and absence of expression serve, if anything, to make face recognition harder. Could a deficit in holistic processing, (impaired in some prosopagnosics) – explain Close’s signature “ripping back and forth” between realistic image from afar to abstract patterns up close? But precocious drawing skills (implying intact perception) suggests a more nuanced interpretation where implied deficits (such as absence of facial expression) represent aesthetic choices, rather than biological constraints. The use of people snapshots as face recognition aids in his day-to-day life on the one hand with the fragmented photographic forms in his portraits on the other – suggest developmentally divergent trajectories in his personal vs. artistic lives. That the actual lesion maybe memory rather than perceptually based is suggested by his difficulty in identifying the invariant features of familiar faces (or prosomnesia) and suggests a different neuroaesthetic model. A model that entails both an embrace and even exaggeration of those ‘deficits’ encouraging the viewer to become prosopagnosic themselves and a re-routing of facial perception via embodied neural pathways that Close likened to the Lilliputian’s enacted mode of perceiving the gargantuan Gulliver. By frustrating conventional facial perception in favor of modes more typically associated neurally with maps, landscapes and even up-side down faces - he creates images more aesthetically complex, ambiguous and novel.

Keywords: case study; prosopagnosia; phenomenology; portrait; holistic; scale; grid; gifted.

Introduction
The contemporary painter Chuck Close is as nearly well known for his assortment of neuro-developmental disabilities including prosopagnosia - as he is for his innovative and unique portraiture. This presents a rare opportunity to explore the intersection between art and brain, deficit and subject matter. Noting the irony his biographer observed: “To have difficultly placing faces is an interesting condition for a future painter of portraits to be afflicted with” (Finch 2010). Finch among others have focused on Close’s gravitation to portraits as a way of coping: “it seems likely that the condition gave him the intensity of interest and the degree of patience to deal with the human face in a particular way” that was echoed by Close himself. But to what degree the unique features of his style were directly shaped by his DP - much less at the neural level are just one of many questions yet to be addressed.

Some of the more prominent of those features include their enormous scale, their photographic origin, absence of background and often blank, expressionless (Close referred to them as mug-shots) visage. In his mature style the photos of his models were systematically divided via a grid into many smaller units and then systematically reproduced on a much larger scale. A hallmark feature was Close’s signature “ripping back and forth” between realistic 3D image from afar (Fig 1) that dissolve into completely non-representational, flat and abstract patterns up close (Fig 2).

Taken together the features reveal Close’s interest in and experimentation with certain recurrent themes, and patterns. The relationship between the image as a unified whole vs. its parts in isolation, the tension between three dimensional reality vs. flat and abstract patterns and faces stripped of expressions that make them look more like maps or objects.

Figure 1: Close self-portrait from a distance.
Figure 2: detail of ear up close.

Interestingly these contrasting relationships and distinctions bear a striking resemblance to the way the brain organizes and parses the many streams of information associated with face recognition and distinguishes them from non-face objects. Particularly intriguing is that face perception is uniquely dependent on holistic (or configural) processing while non-face objects are analyzed more by their parts. Could Close have a holistic (configural) deficit as some prosopagnosics do which make it difficult for him to see the face as a whole and explain his focus on the parts? Or does the absence of facial expression in his portraits imply a deficit in that network?

That said there are equally compelling and competing hypotheses both bottom-up and top-down – that confound these questions. These include the heterogeneity of DP (some have perceptual deficits while others don’t); or the top-down cultural impact of the contemporary art scene that Close was very much aware of and which favored eliminating conventional forms of representationalism and realism in favor of abstraction and flatness.

Then there is the role of Close’s cognitive and perceptual strengths and talents particularly in the visual domain. He was precociously gifted at drawing and painting and facile in multiple forms of imagery – that make a case for a deficit driven style problematic if not incomplete. Lastly, his mature portrait style was relatively late in developing (didn’t just pop up denovo) – suggesting that whatever the effects of DP on his art, they evolved gradually over time and likely interacted with other variables.

Thus the approach taken in this case study stresses a longitudinal, developmental perspective. Starting with a phenomenological analysis of his so called eclectic brew of disabilities and talents, the role and effects of DP on both his personal (non-professional) and artistic lives will be tracked.

Equally relevant to his deficits the evidence suggests that Close’s talents coupled with a remarkable psychological resilience and capacities to adapt, accommodate, and exploit his strengths and talents to modify his deficits also shaped the course of his prosopagnosia and portraiture style. From an initial convergence between art and life – their subsequent trajectories and functions begin to diverge in critical ways.

Yet whatever the relationship between Close’s DP and his art it cannot afford to ignore what maybe the central paradox of his work. That it serves, more often than not, to make recognition harder or at the very least more complex - not easier. Indeed many of his work’s defining features – such as their enormous scale (making it impossible to take in the whole image at once) or their lack of emotional expressivity – and contextless backgrounds – suggest that a coping model (serving to mitigate his deficits) is only a part, even minor, part of the “answer”.

**Phenomenology**

**Developmental Prosopagnosia**

It has been well documented that Close not only had DP from an early age but that it also had a significant impact on his life. “I’ve had my face blindness, or prosopagnosia, my whole life. Really, it’s been a nightmare situation for me.” (Kung, 2009). It was on a continuum, with great difficulty in recognizing people he knew or should have known but not so severe that he could not recognize generic faces. In a PBS News-Hour interview (Brown, 2010) he stated: “It’s a sliding scale … I have a great deal of difficulty recognizing faces, especially if I have just met somebody, it’s hopeless. I will never remember them again, unless it’s reinforced over and over and over…. And even people that I know very well, if I haven't seen them for a while, it’s like a bucket with a hole in it. Information is coming in, but it’s pouring out the bottom just as fast. And I’m often losing information.”

That both his DP and other learning disabilities (LD’s) effected his art as well was made quite clear by Close: “….virtually everything about my work has been driven by my learning disabilities, which are quite severe, and my lack of facial recognition, which I’m sure is what drove me to paint portraits in the first place. I don’t know who anyone is and have essentially no memory at all for people in real space …” (Kung, 2009).

Like other DP’s Close appeared to rely heavily on various non-facial contextual cues for recognition recalling an anecdote of failing to recognize an ex-girlfriend (and feeling badly about it) on the NY subway – a setting that she had not been previously associated with.

**An Eclectic Brew: Other Deficits and Strengths**

In addition to his DP Close had a number of other LD’s including, Dyslexia, problems with mathematics (adding and
subtracting), near-sightedness and astigmatism, as well as Attention Deficit Disorder (ADD) (Finch, 2010). These issues are relevant to an examination of DP because of the potential overlap in both visual, perceptual and memory functioning.

Difficulties in memory such as retaining certain kinds of information (not just for faces but also names and other data) were especially prominent in academic settings. Finch (2011) reports that “His academic problems appeared to center especially on memorization. It’s not a question of having a poor memory - he had an excellent memory for “everyday events” … but rather of being unable to retain data that was presented in the way that was considered normal”.

But the one way that he could remember faces was “when I flatten them out in a photograph, I can commit that image to memory in a way; I have almost a kind of photographic memory for flat stuff” (Brown, 2010).

**Talents and Coping Strategies – A Convergence Between Life and Art**

Relying on his “photographic memory” for flat images is emblematic of the critical role that talents and strengths played in offsetting and compensating for his deficits. Finch (2010) states: “It was in his words, a matter of maximizing his skills and minimizing his deficits, a balancing act that would define his progress in the world.”

On a more general personality level he demonstrated not only resilience to setbacks (including a mid-career stroke that left him quadriplegic), he was a creative and flexible problem solver and was self-reflective, especially with regards to his perceptual idiosyncrasies. He also employed more specific tactics to control distraction and impose order like isolating himself in a bathtub when studying for school exams (and to some degree duplicated in his studio with systematic and orderly creative methodologies).

But two strategies/skills deserve special attention because they not only reveal an early convergence between his artistic and non-artistic lives they also played distinct roles in the development of his aesthetic style. The first are his extensive array of visual talents and the other entailed a method of negotiating complex projects by dividing them up into smaller, more manageable units.

**Visual Precocity**

His exceptional (“photographic”) memory for ‘flat’ images (as in snapshots of people) that he used to recall faces appears to have been part of a broader suite of precocious drawing and visual talents. Finch (2010) describes Close’s “precociousness at representing objects in two dimensions … (and) an early intuitive understanding of perspective” (Finch, 2010). It also included the more conventional skill of drawing realistically and included the more esoteric talents of mirror writing and writing upside down. In an ironic anecdote a teacher attempted to “correct” his drawing that was simply more advanced.

**Flattening the World and the Pivotal Role of Photographs**

It was not just a matter of copying. He had a unique capacity to represent a variety of both visual but also non-visual data in two dimensional format. Responding to an assignment to describe the Lewis and Clark expedition, he created “a ten-foot long illustrated map that presented the story of the expedition” (Finch, 2010) thus converting a largely written narrative (which he had more difficulty constructing) into graphic form. A skill far more advanced and flexible than a savant like talent for making realistic imagery.

Converting various aspects of the world into planar representations, from maps, diagrams, to photos, extended beyond academic settings. It literally helped him navigate the world: “An ability to reduce topography to two dimensions proved to be a solution to one function of his dyslexia” and manage his and other dyslexics tendencies to get lost in unfamiliar neighborhoods by converting the layout of the streets in form of a map or aerial photograph (Finch 2010).

It’s in that broader context that his talent for flattening brought together the profound role of the photograph in both his day to day as well as his artistic lives - from snapshots of faces as memory aides, to even using photos of student’s paintings to recall them. Not only could he “learn a face more easily if he could see it represented in two-dimensions…. it inclined him towards an interest in planar representations” (Finch, 2010).

**Breaking Down to Reconstruct**

Close often spoke of constructing his paintings as if they were physical objects. The photos he used as models for his paintings were systematically divided thru a grid system – the image broken down into simpler units - and subsequently reassembled and reproduced on his canvas. This too appeared to have its early roots in non-art settings that was subsequently coopted into his art. Finch (2010) reports: “Today Close is convinced that his hunger to understand the mechanics of pictorialism had much to do with his dyslexia and his prosopagnosia. Even in two dimensions you had some difficulty recognizing faces but understanding how an artist … created a likeness for example by distributing light and shadow to obtain a chiaroscuro effect was helpful”. And “Analyzing how a painting was built taught him to break down a whole into component parts that could be more easily digested… as he grew older and his difficulties at school increased he discovered that by breaking academic tasks down into their component parts he could master them more easily …. the incremental process by which he would make paintings as an adult is clearly prefigured in his early struggles to overcome his perceived learning disabilities…”

The overlap between life and art also played out in the relationship between the physicality of art making and his perceptual processes. Self-reflective, and analytical Close links an interest in visual perception to the process of dis-
assembly and re-assembly. He stated: “In my art, I deconstruct and then I reconstruct, so visual perception is one of my primary interests,” says Close. “I’m very interested in how we read things, especially the link between seeing two-dimensional and three-dimensional images, because of how I read” (Kung, 2009).

Where Life and Art Diverge – From Mitigating to Embracing?

Thus far the major effects and influences of his DP and other LD’s both in life and art appear to converge and largely appeared to serve the common objective of mitigating or overcoming his DP. Wether to manage their overwhelming complexity (i.e., breaking down tasks) or facilitate face recognition (using snapshots as aides). But as indicated previously - the predominant experience of viewing a Close portrait – is just often the opposite. From their enormous scale, to the absence of any identifying context, background or facial expression the features of his aesthetic, combine, if anything, to make recognition more difficult! Signaling a major shift it raises an entirely different set of questions and issues – about the role and effects of his DP in his art.

Scale

Perhaps one of the most prominent factors contributing to this disorientation is their scale. As Finch (2010) explains, Close’s use of scale differed from the way many other artists like Michelangelo – or for that matter a Times-Square billboard which (Finch, 2009) “…were intended to be seen from a distance and thus seen in normal fashion … Close had something different in mind. He had no objection to the canvas being seen from afar, where the image’s proportions could be understood in a conventional way, but he was much more interested in the impact that it would have at close range, where it would be impossible for the viewer to digest the information in the usual way.”

It opened up new ways of looking at what is arguably one of the most familiar and conventional visual forms. Referring to one of Close’s early breakthrough works (Large Nude) Finch states: “It might be said that Close was inviting the viewer to look at a female nude as if at a landscape seen through a panoramic window. Shoulders and breasts become mountains, a surgical scar, a crevasse.”

It suggests a very different type of perceptual strategy to viewing the face or body that are typically employed – highlighting a dynamic between conventional realism vs. abstraction (patterns and forms devoid of semantic or personal meaning) – that resonated at both the level of contemporary 20th century artistic concerns of which Close was keenly aware and as Finch and Close suggest at the neurological level as well.

“…this monumental increase in scale makes that most figurative of subjects, the human likeness, less representational and more abstract. Even from a few feet away, it is impossible to take in the whole of Big Nude at once, and so the eye scans it, isolates elements, and begins to search for relationships between them. Part of the brain tries to use the magnified information to piece together what we know the naked female body to be. Another part takes elements that have been isolated and reads them in a wholly new way.”

“I love that ripping back & forth”

That shifting of perceptual strategies – from whole to part, real to abstract is perhaps no better illustrated than the dynamic alternation that occurs as one approaches a Close portrait from afar and gradually moves closer to the canvas surface. From initially experiencing a realistic image at a distance to an image that breaks down, and dissolves into completely abstract visual patterns up close. That Close not only intended or was aware of this process he makes it also very clear that he embraces and emphasizes it. “ And I love that ripping back and forth. And when viewers confront an image that’s nine foot high, its hard to see the thing as a whole…” (Brown, 2010).

Being like a Lilliputian – Embodied Perception

Viewing a Close portrait is not a static experience. Unlike most many traditional paintings that can be observed from a singly viewpoint – Close makes it clear that viewing his portraits is an enacted and embodied experience – literally covering a wide territory. And not just back and forth from the canvas for the part/whole effect. Close has famously analogized his works and the viewer’s experience to the way the Lilliputians explored Gulliver.

“I’ve often thought that my works were similar to the situation in “Gulliver’s Travels,” when the Lilliputians are crawling all over the face of this giant man they don’t even know they are on. They know all of the information about this unique landscape — which just happens to be Gulliver’s face — yet they can’t put all the pieces together. It’s an apt metaphor for the way I see and the way I work” (Kung, 2009).

Yet the Gulliverian metaphor extends beyond the act of viewing - it also reflects the historical record of its making. In a television interview he states: “And they're made by hand slowly, piece by piece, not the way a photograph is made or an image on an computer screen. And when viewers confront an image that's nine foot high, its hard to see the thing as a whole, and they're scanning it … what they're doing is… much the same thing that I do when I paint it, which is seeing the journey that I took to build this image. And I build them, rather than paint them” (Brown, 2010).

At the Neural level

Normal face processing is characterized by a distributed, multi-component and hierarchical neural network (Duchaine & Yovel, 2008). Faces are processed differently than non-face objects or landscapes and are distinguished by
configural (or holistic perception) that contrasts with the featural or part oriented processing associated with objects. But the function that underlies the recognition and identification of specific individuals (and seems closest to Close’s subjective accounts) seems to be associated with the capacity to generate a so called constant or view-invariant representation, as described by Haxby (2000): “The representation of invariant aspects of faces underlies the recognition of individuals”.

Given the complex and modular nature of face processing it is not surprising that prosopagnosia is a heterogeneous condition ranging from the very severe with near total face blindness (including for generic faces) to more discrete difficulties in recognizing specific individuals. While standardized assessments of Closes DP are not available the data thus far suggests deficits in either holistic (i.e., perceptual) and/or memory processing.

The possibility that Closes may have a perceptual (i.e., configural) deficit is inviting and certainly worth considering. That would be consistent with both the several aesthetic features that serve to disrupt configural processing (such as large scale) and Close’s own subjective descriptions of difficulties in grasping the “whole”.

That said there is compelling evidence that configural processing, at least as typically assessed in prosopagnosia, would be found largely intact if Close was formally tested. He could easily identify images of generic faces (which still requires configural processing) and for that matter specific faces of individual people if represented as flattened static images (i.e., photos) or in real life (as long as they didn’t move). It is conceivable that a more subtle form of holistic processing deficit, perhaps involving moving forms in real time that Close often speaks of having difficulty with or the more general issue of needing to break down complex entities into simpler elements.

Where’s the Deficit? Does Close have Prosoamnesia?

So if its not configural (perceptual) what is it? Taken together and supported by his own subjective descriptions that stress difficulties in either retaining information (for faces but also other things) points, instead, to a problem in memory. Able to recognize faces for brief periods (suggesting initial intact perception) – the difficulty becomes apparent over more extended periods.

Even more revealing was his description of what it was like to view a moving head. Ordinarily the brain integrates the flux of varying images into the experience of perceiving a constant face seen from multiple perspectives. But Close describes something quite different (Brown 2010): “if you move your head an half an inch to me it’s a whole new face I’ve never seen before…”. Consistent with Haxby’s formulation it suggests he could not extrapolate the invariant features of the faces seen from shifting viewpoints. Instead the face becomes a series of new faces that’s consistent with a subtype of prosopagnosia characterized by intact configural processing, termed Prosoamnesia.

The literature describes cases of prosoamnesia that bear striking resemblance to Close’s experience. Duchaine (2000), reported that “behaviourally, it has been observed that some prosopagnosic individuals may have an intact percept of faces and perform well on matching faces shown in the same view while being impaired in matching faces that differed in viewpoint. Thus, it is important to distinguish performance with and without a viewpoint change in assessment of face processing deficits”.

Complex Relationships between Brain and Art: Re-routing perception and deficits with benefits

So how has the specific nature of Close’s prosopagnosic deficits relate to his unique stylistic features? Needless to say the relationship is complex, entails multiple levels of interactions with both bottom-up and top-down inter-actions which evolve over time. For example could a configural deficit at least partially explain the variety of ways that Closes portraits serve to disrupt holistic recognition? Or does a neural deficit in social processing explain the lack of facial expression in his portraits.

With regard to the latter it seems fairly safe that the answer is no. The absence of expression was not neurally driven – it was clearly an aesthetic, top-down choice. Given that facial expression and eye gaze is sub-served by its own separate neural network – dissociable from perceptual or identity recognition - by all accounts Close had no problem with identifying facial expressions or emotions. That’s important if only to underline the necessary caution in drawing inferences between art and brain. It’s an example of what can be termed a ‘faux’ deficit – where a conscious choice is made to disrupt a perceptual function in the absence of any underlying neural deficit.

Similarly an outright configural deficit is unlikely to explain Closes apparently seemingly deliberate frustration of holistic processing. Perhaps a more complex as yet to be determined deficit in deciphering 3D objects in real time might be involved (and for which his exceptional memory for flat images could not compensate) and possibly related to his presumed Prosoamnesia.

What is more clear is that in his art work Close not only self-consciously embraced his prosopagonia – he may well have amplified, and even exaggerated, his deficits – forcing one to forego the conventional pathways assigned to process faces. And he did so with both intent and awareness of their effects at obfuscating conventional neural channels – even delighting it in. In that sense he may be said to be like Zeki’s intuitive neurologist – ‘naively’ aware of the brains natural parsing of visual information but also adroit at manipulating pathways - and redirecting them to others. Whereas in his day to day life he developed strategies to mitigate them – in his art he did just the opposite. He both engenders in the viewer an embodied and enactive experience (simulating his experience of historically assembling the image) but also
encourages her to make perception literally a ‘moving’ experience.

In rerouting perception (both figuratively and literally) he also appeared to have understood – perhaps implicitly - the aesthetic power of some these alternative neural pathways. Could there be, for example benefits to disrupting configural processing in favor of featural? Focusing on the trees rather than the forest?

In her study of precociously advanced children in the visual arts Drake & Winner (2009) found that they shared with similarly talented children on the autistic spectrum a local processing bias (at the expense of the whole) that aided them in capturing details of a scene. She states: “Artists seeking to draw realistically have often relied on aids that help them to overlook the global aspects of the scene they are trying to draw and instead to keep their eyes trained on the local components: aids such as Durer’s grid (where the artist looks at the scene through a grid and draws what is seen in each section of the grid, part by part) or the trick of looking with one eye through a viewfinder are both ways of breaking up a three-dimensional scene into smaller parts and weakening the influence of the whole. Even without such aids, however, artists may be skilled in focusing on local components of a scene either because they have trained themselves to do so or because they have the same kind of atypical visual processing”. Durer’s use of a grid to “break up a three dimensional scene into smaller parts” bears of course a striking resemblance to Close’s methodology. Whether learned or innate it also suggests a spectrum of altered visual processing where the line between atypical/exceptional and pathological maybe blurred.

References


A Cognitive Ethnographic Study of Improvisational Drawing by Eight Contemporary Artists

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Abstract
This interdisciplinary study brought together methods and theories from both art education and cognitive psychology to study the cognitive interactions underlying drawing within a specific contemporary context. Improvisational drawing was defined as an open-ended process, rather than the rendering of a predetermined image or scene. A cognitive ethnographic methodology was used to document and analyze eight artists’ improvisational drawing practices, in their own studios, through video recording and retrospective reports. Common structural components and dynamics as well as differences between participants were found.

Keywords: drawing; cognition; contemporary artists; improvisation; situated cognition; cognitive ethnography

Introduction
Artists and others draw to see and play with their thoughts on paper in order to generate, explore and test ideas and perceptions (Tversky, 1999). They often say that they do so in order to “have a conversation with myself.” The writer and artist John Berger has explained, “Every artist discovers that drawing—when it is an urgent activity—is a two-way process. To draw is not only to measure and put down, it is also to receive” (2005, p. 77). As marks accumulate, they may present opportunities for the drawer to discover and invent visuo-spatial associations and relationships. This can be understood as a series of directed, top-down, and sensory, bottom-up interactions, as the drawer sees and responds to the marks she has made on the drawing surface.

This study investigated, moment to moment, the characteristics of top-down conceptual insights and bottom-up perceptual cues and procedures that support the drawing “conversation.” Cognitive acts such as planning, analyzing and evaluating are task-directed and top-down, initiated by an explicit reasoning process. Metacognition, the awareness and understanding one’s cognitive processes (thinking about thinking) is also a conscious top-down process. Bottom-up processes include both visual and non-visual forms of perception, automated routines and procedures as well as emotional responses.

The top-down, bottom-up exchange that underlies the activity of drawing is fundamentally non-verbal, and relies on visuo-spatial, rather than verbal reasoning. Once a drawing is launched, artists are on the lookout for something: a spark or a seed that can get the drawing moving. A random variation in marks might stimulate the artist’s imagination, like Leonardo’s cracks in a wall or clouds in the sky. Experts know how to take advantage of an innate perceptual drive for meaningful patterns, in order to stimulate their visual imagination, making meaning out of accidental variations (Fish & Scrivener, 1990). As the drawing progresses, indications of borders and edges, figure and ground begin to develop. The illusion of highly specific and three-dimensional forms and spaces may emerge that cannot easily be described in words.

Staying alert to new information that might be coming from the drawing itself, artists practice what Suwa & Tversky have termed “constructive perception” (2003). They seek opportunities to relate and connect parts, consciously striving for a sense of overall coherence. Simultaneously, they rely upon anomalies, random variations and unplanned coincidences to generate further development. One study participant explained that the pleasure of drawing comes “when the formless void of marks and erasures burp up something funny or alive.” Experts are on the lookout for that “burp” and make the most of it. Oscillations between activity and observation become feedback loops that drive the drawing forward.

The researcher has been a working and exhibiting artist for over twenty-five years, which significantly informed the goals and methods of this research. As a participant-observer in a “community of practice,” she shared a similar educational and socio-cultural background as many of the participants (Wenger, 2008). This facilitated her rapport with participants and provided a deeper understanding of the data than might have been possible otherwise. The researcher monitored how personal background knowledge and biases might adversely impact the research, and attempted to limit clues inadvertently offered to participants regarding the research agenda.

As with any qualitative research, the results are limited by the data collected. The primary data consisted only of the first half hour of one particular drawing session for the eight artist/participants, and cannot be used as a comprehensive survey of contemporary artists’ drawing practices. Differences in the overall amount of time required to finish a drawing among the participants also limited the basis of comparison. A few of the subjects finished or almost finished their drawings within the half hour sessions. Others required several more sessions to complete the drawing; and a few ended up abandoning the drawing or starting over after the videotaped session.

Based on previous research, which has used video documentation and retrospective interviews to investigate researcher-defined drawing tasks, such as problem-solving or accurate rendering, this research breaks new ground by looking at open-ended participant-defined drawing tasks in a participant-designed setting. New understandings of expert practice emerging from this study could shed light on generalizable and potentially transferable aspects of the kinds...
of embodied and embedded thinking strategies underlying improvisational drawing.

**Methods**

This was a qualitative, cognitive ethnographic study (Ball & Ormerod, 2000; Hutchins 1995, 2005; Kirsh, 2009, 2010; Williams, 2006) of contemporary artists’ drawing practices in a naturalistic setting. The activity of drawing, rather than the drawings themselves, was the primary object of study. There was one sole researcher, though data was shared with fellow researchers, to validate coding and analysis methods, and with the artists themselves as appropriate. A video recording of the first half hour of a drawing, as the artist began work in his normal studio environment, in his habitual manner, was the primary data source, accompanied by an immediate retrospective interview. During the retrospective interview, the artist and researcher viewed the video together, and the artist narrated his thinking as he watched himself draw. This data was supplemented with open-ended interviews with artists, including some that did not participate in the study.

**Cognitive Ethnography**

The design of this study was based on cognitive ethnography, a methodology that situates a fine-grained analysis of cognitive interactions within complex real-world settings in which they would normally take place. Cognitive ethnography is built on the theory of distributed cognition, which calls attention to the way that thought does not only take place within individual minds, but also in interactions with the environment and other minds (Kirsh, 2009). Theories of distributed cognition, which see any task as embedded in specific physical contexts, provide the theoretical framework for a comprehensive, ecologically valid data collection and analysis (Schmuckler, 2001). Unlike traditional ethnography, which tends to emphasize the what and why of meaning making, cognitive ethnography focuses on the process of how meaning is made.

The goal of this study was to develop a generalizable model of improvisational drawing. The process of making a drawing (how) takes center stage, and the artist’s description of meaning or context is less important. Looking at drawing in this way allows for an examination of the drawing process that is independent of subject matter, source material and the artist’s expressive purpose. Instead, this research provides an analysis of expert thought and behavior that may be applied across many different drawing contexts.

**Video Recording and Retrospective Reports**

Non-verbal drawing activity, as documented through video, was the primary source that was coded. Retrospective verbal reports served to supplement and explicate actions as perceived by participant and researcher while reviewing the video recording. Retrospective reports can be understood as post-hoc translations of non-verbal and verbal top-down reasoning processes. Mental processes underlying mark making are fundamentally visual, spatial, and motor, dependent on a dialectic between action and perception (Goldschmidt 1991).

There are practiced routines (motor schemes) that an expert drawer’s hand can execute without looking, while the intense looking and seeing that can accompany drawing may preclude words. The expert participants in this study had all developed habitual routines of mark-making, so that procedures, which originally needed to be designed and directed through a top-down process of conscious planning, took place automatically. Automation of sets of bottom-up, related perceptions and actions allowed them to attend to global planning and evaluation of their work.

Procedural knowledge, which may operate under the radar of conscious thought, can be observed in action through video recording of expert behavior. At the same time, drawing is a deliberate activity. It requires focused attention to interactions between top-down processes of planning, decision-making and evaluation, with bottom up processes of perception, salience detection, and execution of automated visuo-motor schemes. Video alone could not give insight into the drawer’s internal mental processes. Conscious trains of thought were retrospectively reported by participants.

The method used in this research was modeled on the study of an architect’s sketching behavior described by Suwa, Tversky, Gero and Purcell, in their study, *Seeing into Sketches* (2001). Suwa et al. found that verbal reports immediately following a sketching session enabled the subject to work without the interference that might be caused by the think-aloud method. By conducting the retrospective interviews immediately following the video, potential decay of memory seemed to be avoided (2001).

In Whale’s study of expert artists’ observational drawing practices, he found some evidence that concurrent reporting could be disruptive, and also found retrospective reports were very effective in eliciting information about artists’ drawing strategies and decision making processes (2006). Like Whale, Fava, used both concurrent and retrospective reports for protocol analysis of observational drawing, and found retrospective reports could offer more insight into the overall strategy and the reasoning behind decisions.. (2014) Based on these previous studies and the researcher’s own experience as a practitioner, immediate retrospective interviews were chosen as the primary source of artists’ verbal reports, though unsolicited concurrent remarks (made during the videoed drawing session) were also recorded and incorporated into the analysis.

Drawing materials and implements were limited, so that the variables introduced by the qualities of the materials themselves did not obscure the similarities and differences in the artists’ interactions with their work. Only monochromatic drawings made on paper or other flat substrate were included. Only the first half hour of a drawing was video recorded, since this is usually when a dialogic process is established between the artist and his drawing.
**Artist Selection**

This study focused on detecting and describing specific skills and strategies that constitute expert drawing behavior, rather than the drawings themselves. Given that objective measures of skill are hard to come by in contemporary art because of the diversity of drawing means and ends, professional artists over 40, with a substantial history of artistic engagement were selected. Participants engaged in art as a full-time occupation (as practitioners and educators) and exhibit regularly in established art venues. The research interest was in the description of skills and understandings cultivated in a sustained and sustainable process of engagement and discovery over the course of a career. Short initial interviews screened for artists who met this criteria, and reported a spontaneous and improvisational drawing method as opposed to the execution of a pre-formulated plan.

The eight artists who participated in the study represented a variety of contemporary drawing practices. Drawing materials included pencil, ink and charcoal fingerprints, and sizes of the drawings varied, from a small notebook to a large wall. The visual stimuli artists used and the ways they used them were also diverse. Three of the artists worked from observation. Their drawing ranged from recognizable portraits, intentionally unrecognizable details of everyday objects and the process of observation itself, with elements coming in and out of recognizability. Four of the artists invented forms as they worked, without direct visual stimuli. Their drawings included imaginary landscapes, something as seen under a microscope and visualizations of non-visible phenomena, resembling the tracings of an oscilloscope or radio waves. One artist drew from a variety of images that she surrounded herself with, including vintage comics and her own previous work.

All eight artists shared a common goal of allowing the drawing to emerge from the process, rather than simply rendering a preconceived image or concept. This is an important limitation of this study, in that future work remains to be done to see if and how the process of drawing for accuracy might differ from the process of improvisational drawing, as it unfolds in time and space.

The video recordings, including concurrent remarks by the artists, were matched with their retrospective narrations of the drawing process, linking observable actions with self-reported thought processes. Data were treated in a variety of ways that built on a foundation of close observation of the drawing process, as recorded on video. Categories of distinct types of drawing actions emerged, and were coded and incorporated into video timelines. Transcripts of retrospective interviews were added to timelines in order to identify key moments when conceptual insights seemed to occur, and relate them to physical actions.

Video was broken down into individual actions, segmented by observable breaks, which were identified by a pause, shift in direction or tempo, or jump to a new area. Activity was analyzed and segmented into individual actions. Breaks between actions were defined by either a jump to a new area of the drawing, or a visible change of the type of activity in a single area. Sequential actions were described on video timelines that recorded the duration and location of each action for each participant. Location on the drawing surface was coded in nine sections, divided vertically in top, center and bottom and horizontally in right, center and left areas.

**Results**

Drawings take shape through a series of discrete actions that can be observed directly. These actions, as recorded on video during each artist’s first half hour of drawing, provided the basis for the coding process that is the foundation of this study. A taxonomy of types of drawing actions emerged, and a coding scheme was developed, through close and repeated viewings of the video recordings, enhanced by sketching from observation while watching the video.

**Locate, Extend, Connect, Reinforce and Revise**

Five types of actions emerged from video analysis, described in Table 1, below. Two types of marks in a new area and three types of marks revisiting an already established area of the drawing were identified. These broad categories were clearly observable in the video, without necessitating any interpretation or explanation by the artist. This taxonomy was shared with other researchers and artists, and provided a flexible, comprehensive framework for analyzing many different kinds of drawing, potentially beyond the specific examples analyzed in this study.²⁸

Analysis of the data suggests that is likely that over a larger sample size, at least the first three action types, patterns of pauses between actions varied greatly between subjects, and not enough data was collected to code for the character or purpose of each pause. It was not clear whether the artist was simply taking a rest or whether a particular kind of planning or evaluation process was taking place, and retrospective reports were insufficient to determine this. Other researchers (Brew, 2011; Fava, 2014) have studied the pattern and function of pauses in the drawing process.

<table>
<thead>
<tr>
<th>Action</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Locate (new area)</td>
<td>Indicate an area to be developed later</td>
</tr>
<tr>
<td>Extend (new area)</td>
<td>Move outward into new areas of the drawing surface from locating marks; expand in two dimensions</td>
</tr>
<tr>
<td>Connect (revisit)</td>
<td>Link two established areas of the drawing together, combining parts to form new wholes</td>
</tr>
<tr>
<td>Reinforce (revisit)</td>
<td>Refine, add detail, darken or emphasize established areas of the drawing; defining features; developing an illusion of 3-D</td>
</tr>
<tr>
<td>Revise (revisit)</td>
<td>Erase or draw over a previously established area of the drawing</td>
</tr>
</tbody>
</table>

²⁸ Patterns of pauses between actions varied greatly between subjects, and not enough data was collected to code for the character or purpose of each pause. It was not clear whether the artist was simply taking a rest or whether a particular kind of planning or evaluation process was taking place, and retrospective reports were insufficient to determine this. Other researchers (Brew, 2011; Fava, 2014) have studied the pattern and function of pauses in the drawing process.
locating, extending and connecting, would be found to be close to universal in drawing activity. All but one of the participants made reinforcing moves, adding and enhancing specific details and forms. Five out of the eight participants revised their marks, either by erasing or overdrawing. It is likely that in a larger study, at least the first four action types would be seen in a majority of participants, with many but not all drawers revising their work. It was observed in this small sample that reinforcement and revision served to enhance the three-dimensional qualities of the work.

It is possible to imagine a drawing process that only consisted of locating and extending, however this research implies that such a process might not even be considered drawing, but more a pre-drawing activity, which on its own, would a kind of inattentive doodling. It would be a monologue rather than a dialog. By failing to connect parts into wholes, the drawer would fail to perceive and respond to emergent properties in the drawing itself.

Drawing Fast and Slow

Dual process theory, first put forward by William James, developed by Sloman and others, is a theory that there are two separate, evolutionarily distinct reasoning systems. Daniel Kahneman has characterized these systems as “thinking fast and slow.” System 1, “fast thinking,” is automatic, intuitive, habitual and largely unconscious. System 2, “slow thinking,” is conscious, analytical and reflective (Kahneman, 2003; Evans, 2008). Spatial placement of action segments in new areas and in established areas (revisits) was coded. The average duration of drawing segments was analyzed to see if drawing in new areas and revisits would follow the patterns of fast and slow thinking. This may be because they were based on decisions or strategies chosen before the drawing is begun. Revisits may take longer because they require reflection-in-action (Schon, 1983). Revisits were guided by the artist’s perceptions of the developing drawing, and entailed connecting, reinforcing and revising. They respond to what is already on the paper, and therefore require observation and analysis, which the pre-planned or habitual locating and extending moves, which go down in new areas, do not.

New Areas and Revisits Over Time

It would be expected that as the drawing surface fills, time spent in established areas of the drawing will increase and time spent in new areas will decrease. This is inevitable, yet in this study, the paths did not go as smoothly as was expected, and the bumps along the way revealed common developmental patterns as well as individual variations.

The chart below shows the aggregate trends of time spent in new areas, as compared to revisited areas, over time. Differences in average speed of mark-making due to size and medium of the drawing were taken into account, so that number of drawing segments, rather than absolute time markers, were used along the x axis, because they more accurately captured commonalities between subjects. 10 segment groups were made, adding up to between 12 and 17 groups of 10 segments (120 to 170 segments total) for each participant. The y-axis represents the sum of drawing action segments, in seconds. The x-axis represents time partitioned into ten segment intervals. Pauses were not counted, since a common pattern or intention was discovered for pauses either within, or between subjects.

For each 10-segment group, new area and revisits were counted and charted. A common early spike in revisits, followed by a spike in new areas indicated that artists focused on developing one or more areas of the drawing, before moving on. Video timelines and artists’ remarks were compared with these spikes, which demonstrated the significance of these moments in the development of the drawings. The early peak of revisits in the graphs coincided with many of the artists’ retrospective reports.

Most artists mentioned looking to discover “what the drawing was going to be about,” as one participant put it: searching for clues in specific parts of the drawing that they could reinforce and enhance, and often this was the point at which the drawings developed an illusion of three-dimensional form and space. These areas served as reference points, or test areas, to help guide future development of the drawing. It seems that the first place where the graphed lines cross is when the drawing first takes form, and becomes defined. Feedback from revisiting the drawing gained in these key areas helped to develop and modify secondary areas, as the process continued and the artist went on to develop new areas. These key areas were established within

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29 Both artists whose actions in new areas and revisits were, on average, about the same length, spent more time pausing between periods of activity, which seemed to imply that they were planning revisits during pauses, rather than in the midst of activity as others seemed to do. The actions of both of these artists were, overall, more rapid that that of the others, which also seems to support the notion there was a greater temporal separation between planning and mark making in these two cases.
the first twenty minutes or less, and remained a central focus of the work through completion. Artists frequently mentioned that they intentionally did not have an image of the end result, and in fact, set themselves up to “get lost,” or “in a situation where I will have to work my way out of it.” The artists referred to learning “the rules of the game” by playing out the consequences of certain decisions in one area, before moving on to the rest of the drawing.

Further research might be conducted to see if experienced drawers who intentionally set out to make a drawing with a clear image in mind of the final product (such as an accurate rendering of a still life) would have, in aggregate, fewer intersections between new areas and revisits. It seems that the place where revisits first overtake marks in new areas is when the drawing first takes form, and becomes defined.

Success and Failure
For the purposes of this study, success was defined by the artists themselves, most of whom continued their drawings after the video session. The process leading to success relied upon the inference of guiding principles from key area(s) or moment(s) in the drawing process. Success depended on finding opportunities to define specific details in a way that supported the overall composition, balancing featural and configural information. This was necessary in order to generate a fully developed, coherent whole from varied parts.

The drawing “failed”, at least in the eyes of the artist who made it, when individual parts did not relate satisfactorily to other parts. Drawings were abandoned when reinforcement and revision failed to connect and cohere the parts enough to build a sufficient foundation for continued development. Yet, this was also a learning experience: the negative result motivated and informed the artists as they subsequently made new drawings. Although no radical breakthroughs by the artists were observed as they were drawing in this study, several reported important turning points in their work resulting from failed drawings. In both the successful and unsuccessful drawings, marks on a surface provided constraints and opportunities, leading to a series of feedback loops in which prior decisions influenced subsequent marks.

This dialectic was characteristic of the cognitive and metacognitive interactions underlying improvisational drawing for all the participants in this study.

Conclusion
Skilled artists consciously construct a situation not entirely under their control, intentionally getting lost, “skittering around,” letting their hands lead the way. They orchestrate a process that they cannot predict, motivated by the desire to see what will happen. One artist described the experience of “yielding my own control to the process and almost being able to watch the drawing make itself,” as highly pleasurable. Artists continuously evaluate their progress, as each action they make both responds to past decisions and sets up a new sequence of choices.

Long before the drawing session started, participants had committed to an individual course of action, specific procedures on which they had learned to rely. The tools, surfaces, scale and surroundings used to draw by the artists in this study differed widely, as did the inspiration for their work. Some of the participants worked from observation, others from their imagination; some referenced recognizable imagery and others kept their forms and shapes ambiguous and un-nameable. Yet, despite these differences, the essential nature of the process they went through to generate and explore visual and spatial ideas was similar.

All of the artists in this study referred to their lack of a clear destination. One explained, “I really do set up a situation so that I am as lost as possible.” Each of the artists was making one in a series of similar works, and letting go of conscious control and planning processes as a strategy to make sure each of these works was unique. Research has shown that experts tend to postpone resolution in favor of ambiguity, while novices prematurely fixate on solutions. Novices, without specific training in drawing, tend to rush toward certainty, prematurely fixating on a final outcome. (Kavakli, et al., 1999; Suwa & Tversky, 1997; Verstijnen et al., 1998). The extension of uncertainty in the drawing process to consider multiple alternative solutions seems to be an acquired skill.

Drawing to Learn
Traditionally, drawing skill was understood as the ability to faithfully depict what is seen, using pencil or pen on paper. Today, with digital photography as accessible and ubiquitous as our cellphones, learning to render a pre-conceived scene or idea may no longer be a sufficient justification for the inclusion of drawing instruction in education. Instead of simply learning to draw, drawing to learn may be a more persuasive formulation for why drawing should be included in the curriculum.

Many have made the argument that drawing teaches us not just to draw but to see, to appreciate textures, patterns, forms and shapes that might otherwise go by unnoticed. But teaching observational skills is only the beginning. This study suggests that improvisational drawing is a way to develop the ability to generate unanticipated outcomes.
through interacting in specific ways with lines and marks on a flat surface. More research needs to be done to determine whether drawing may teach skills and strategies students can use to analyze, ideate and envision across disciplines.

The artists in this study engage in prolonged exploration and iterative development of alternative scenarios, creating series of drawings to explore a given theme or set of visual concepts or approaches. They make choices of materials and methods and then see where these choices lead them, a model of intrinsic motivation. Metacognitive capacities might be cultivated through training in drawing as an ideal example of reflection-in-action, not only to solve pre-defined problems, but also to learn how to find and define problems for oneself. The same properties of immediacy and simplicity of means that makes drawing an ideal arena for artists to experiment and explore, can hold true for students in K-12 and higher ed.

Allowing and attending to ambiguity and accident, taking the time to allow the drawing to develop and not rushing to premature solutions: these are some of the lessons students and educators might take away from this close examination of improvisational drawing processes. In addition, a greater understanding of the operations of locating, extending, connecting, reinforcing and revising might help demystify the drawing process, breaking it down into manageable steps. Learning improvisational drawing may help promote valuable perceptual, cognitive and metacognitive skills, providing a safe and highly accessible arena in which to practice exploration and experimentation.

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References


Saccades, Fixations, and Body Sway with Op Art

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Abstract
This study examined the effect of oculomotor condition (fixation versus free exploration) on the sensation of motion as well as the body sway of subjects viewing Op Art paintings.

Keywords: Op Art; posturography; macro and micro eye movements; body sway; motion sensation

Research Overview
Op Art generates illusory visual motion. It has been proposed that eye movements participate in such illusion. This study examined the effect of the oculomotor condition (fixation versus free exploration) on the sensation of motion as well as the body sway of subjects viewing Op Art paintings. Twenty-eight healthy adults in orthostatic stance were successively exposed to three visual stimuli consisting of one figure representing a cross (baseline condition) and two Op Art paintings – Bridget Riley’s Movements in Squares and Akiyoshi Kitaoka’s Rollers. Before their exposure to the Op Art images, participants were instructed either to fixate at the center of the image (fixation condition) or to explore the artwork (free viewing condition). Posture was measured for 30 s per condition using a body fixed sensor (accelerometer). The major finding of this study is that visual exploration of the two Op Art paintings induced a larger antero-posterior body sway both in terms of speed and displacement in the free viewing condition as compared to the fixation condition. This effect was significantly stronger for the Riley painting than it was for the Kitaoka work. Interestingly, participants reported higher sensation of movement in the former condition. These results suggest that macro-eye movements increase both the illusory motion effect of Op Art as well as antero-posterior body sway. Preliminary observations from new studies recording posture and eye movements at the same time will be reported.
Creativity in Dyslexia

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Abstract

This study compared the performance of dyslexics and non-dyslexics on the Torrance Test of Creative Thinking. Dyslexics achieved significantly higher scores of creativity in the TTCT than non-dyslexics from the same school in Belgium, particularly in terms of originality and elaboration.

Keywords: creativity, dyslexia, TTCT.

Goal

Among students of art schools dyslexics are frequent (Wolf & Lundberg, 2002). Are dyslexics more creative? Is it the case in teenagers? The issue is controversial but important (see Everatt et al. 1999). Theories exist on putative neuro-physiological mechanisms (disequilibrium of magno-parvo systems, the latter compensating weakness of the former, see Stein 2012; inter-hemispheric connectivity, see Chakravarty 2009). This study uses the P. Torrance Test of Creative Thinking, TTCT (see Kim 2006) to evaluate creativity in dyslexic and non dyslexic teenagers.

Results

Dyslexics achieved significantly higher scores of creativity in the TTCT than non-dyslexics from the same school in Belgium, particularly in terms of originality and elaboration. Scores of originality from dyslexics were comparable to those of art students from ENSAD. Dyslexics from the school in France (special class) also showed high scores of originality and elaboration. In contrast, dyslexics from the Paris school show moderate scores.

Discussion

Dyslexic teenagers can be highly creative in this test. Yet, expression of creativity can be modulated by educational approach: personal follow up versus normalizing?

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References


Abstract
What would we be leaving out if consciousness were removed from an agent for a given type of processing? If the processing were pattern recognition, problem solving, etc., the answer would be almost nothing, as complex and presumably non-sentient algorithms currently reach close to human performance. The claim of this paper, however, is that almost everything of interest would be lost in the case of aesthetics. This suggests that models of aesthetic processing and especially aesthetic experience should be informed by models of consciousness. An integration of consciousness theory and aesthetic theory along these lines this is proposed. The resulting theory is a natural extension of the idea that conscious systems are ones in which causal interaction is relatively large. This theory is then applied to humor, in order to predict the hedonic boost that typically accompanies the processing of this stimulus type.

Keywords: Consciousness, aesthetic experience, causality, humor

Introduction: Limitations of the Zombie Methodology
Psychology as a whole, and aesthetics in particular has benefitted tremendously in the past century from a judicious, and often implicit methodological choice. This was to put the admittedly thorny issue of consciousness to the side, and to treat the human mind as an extremely complex automaton lacking true sentence. It is unlikely that the great strides that we have seen, especially those emerging from the recent merging of neuroscience and cognitive science, would have been possible otherwise.

However, when it comes to aesthetic experience (AE), the absence of consciousness is much more serious that it might first appear. To see this consider the zombie, a philosophical entity in which cognitive powers remain but qualia are completely missing (Chalmers, 1996). The primary claim of this paper is that the methodology that has served us so well in the past tells us almost nothing about AE in the most important sense. The reason is quite simple. The qualitative aspect of AE is not the epiphenomenal icing on the cognitive cake, but its very essence.

Consider our hypothetical zombie attending a concert, for example. The purely behavioral response of such an entity is of peripheral interest at best. Assume the zombie comes out of the venue raving about a particular song: “That was the best rendition of such and such I have heard in a long time.” The appropriate response (especially considering the zombie has no feelings to hurt) would be something along the lines “Sorry, you have been programmed well, but I am not buying it. You have never heard any songs, let alone appreciated them, including the one tonight.” If there are no qualia there is no real appreciation of art, just a weak facsimile thereof.

Another angle on the same problem is to consider what a theory of aesthetics floating free from a basis in sentience might have to offer. As a working example, let us examine Martindale’s (1984) proposal that aesthetic pleasure results from temporary suspension of lateral inhibition in the brain. As will be argued below, this is a reasonable assumption given a neurally-inspired model of AE. However, we are still left with the nagging question as to just why this sequence of neural events should leave one hedonically satisfied, let alone transported to a better world, as may happen in the case of peak experience.

In summary, there is an explanatory gap lurking in all extant models of AE. This gap need not seriously impede empirical research in this area – after all, it is reasonable to assume that human subjects are indeed conscious, and that their behavioral responses are reflective of these conscious states. Surprisingly, it also does not necessarily prevent theorizing in this domain – one can simply hope that a future synthesis between neuroscience and phenomenology will provide the support for the current conjecture.

But can consciousness then be relegated to a conceptual nuisance when it comes to modeling aesthetics, fine for late night forays into metaphysics, but bearing little or no theoretical import? In a word, no. If consciousness is indeed the sine qua non of AE, then ultimately one wants an account of AE that meshes cleanly with an account of consciousness, flows from this account, and is an integral part of this account at inception.

Why? A parallel may be drawn between the current topic and the relation between physics and chemistry. Certainly, chemistry as an empirical science can operate largely as a stand-alone enterprise, and did so for centuries with considerable success. Furthermore, a science of theoretical chemistry and individual sub-theories (e.g., organic synthesis) may be independent and separable, as it were, from their theoretical godparent, physics.

But it is only by addressing the underlying quantum mechanics, and in particular, the nature of electron orbitals, that a true understanding of why reactions happen emerges. This understanding is not just theoretical window-dressing; one’s predictive powers are also considerably enhanced when one moves from chemistry to physical chemistry. Of course, there are many instances when the underlying physics is too cumbersome to work with, and high-level approximation is appropriate. This does not obviate the fact that these approximations implicitly contain within them the driving
physics, and that chemistry is simply a veiled term for the physics of molecules.

Returning now to the relation between experience as a whole and AE, we can see that a theory of the latter, detached from a theory of experience as a whole is an approximation by a similar argument. The molecules of an AE are aesthetic emotions. Significantly, they are coupled with and usually follow cognitive processes (but see Zajonc, 1980), but this is not their most important aspect, nor their signature characteristic. The most important aspect of AE’s is that they are bona fide phenomenal experiences. If we cannot say how the brain engenders any experience, we certainly cannot fully model how the brain produces particular AE’s. The details of this production process are the physics, as it were, of AE, and to miss out on this aspect is to produce an incomplete model, as well as one likely to have weaker predictive force.

In general, if a model would work just as well for a model of zombie aesthetics, and does not have additional implications for feeling, conscious beings, then something must be missing. Consider Martindale’s proposal as a case in point. Suppose we have two aesthetic stimuli, one clearly superior to the other (say a Bach cantata vs. a random series of notes), and we see a greater reduction in lateral inhibition in the former than the latter. Further suppose that the model aligns with the behavioral data. We can imagine for example, that lowered inhibition causes greater activation to reach the reward system in the cantata case, and that this in turn manifests itself as behavior seeking out the works of the Baroque master.

Such a model could, if elaborated, could possibly provide the mediating causal structure that carries a work of art into the appropriate behavioral response. However, it says nothing about the conscious affective component of the experience. There are at least two additional requirements:

a) A link between decreased inhibition and brain states associated with positive affect, and

b) A notion of just why these sorts of brain states should engender aesthetic pleasure, in a conscious sense, as opposed to merely motivating behavior.

In other words, such an account may, with the appropriate supporting apparatus, provide an indication as to why a zombie is drawn to art, but it does not tell us why we, qua conscious agents, are drawn to art. Note also that saying that a stimulus has the capacity to trigger the reward system merely transfers the problem to a narrower slice of the brain, but does nothing for the ultimate resolution of the difficulty. In the next section, an initial attempt to more directly meet these requirements will be offered.

### A Neural-based Theory of AE

The first step in constructing a neural-based theory of AE is to provide a foundation in a theory of consciousness. It is not possible in this short space to provide a comprehensive account of this emerging field, suffice it to say that in the two most prominent quantitative theories of the neural basis of consciousness, causal interaction plays a critical role. In the first theory, based on information integration (Tononi & Sporns, 2003), this role is implicit, because integration is measured by the active transfer between modules in the brain, and within those modules. In the second account (Seth, 2005), and the one to be discussed here, consciousness is a direct function of causal interactivity.

### Theory Derivation

The main premise of the latter theory is as follows:

**The Consciousness Premise**

*The degree of consciousness is proportional to amount of causal interaction in the brain as it processes endogenous or exogenous stimuli.*

I have suggested (Katz, 2013) that this provides a simpler account than the information integration theory but makes similar predictions; it may also be easier to graft a theory of the nature of the conscious state (i.e. of particular qualia as opposed to the presence or absence of such) onto this account.

We can then layer in what may be termed the aesthetic premise, namely:

**The Aesthetic Premise**

*(Positive) aesthetic experience is characterized by a heightened state of awareness of the sensory and ideational worlds.*

In other words, art frames and repositions quotidian experience in order to direct attention to the essential character of such experience. Alternatively, when the sensory input is non-representational, it is characterized by greater attention to detail than in ordinary perception. Compare, for example, listening to a well-loved piece of music compared to processing background noise.

Taken together, these premises imply:

**The Causal Principle of AE**

*AE is characterized by a greater than baseline degree of causal interaction in the brain.*

The causal principle provides a direct and falsifiable means of quantifying AE. For example, using an approximation to causal interaction over electrode signals in an EEG paradigm, one could measure the difference in this quantity while listening to a piece of music that was well-liked, moderately-liked, and poorly-liked. In the following section however, a
more indirect means of verification through simulation is offered.

**Simulation Results**

In this section, a model of humor is revisited (Katz, 1993). In this model, it was suggested that humor is the result of the support for two ordinarily disjoint concepts. The first concept is supported by a general expectation, while the second by the resolution of the joke or humorous situation. For example, in the joke

*First behaviorist to second behaviorist after making love: “It was great for you, how was it for me?”*

the expectation is the reverse question, but the given question is sufficiently plausible to be entertained because of the anti-phenomenal stances of the participants. There is also a tendentious element as with much humor, which is ignored here for simplicity.\(^{30}\)

Figure 1 shows the putative states of both a neural network modeling this situation and the corresponding causal network as the joke is processed. At time \(t_1\) the joke context triggers a concept or interpretation. At time \(t_2\) one “gets” the joke; that is, an alternative and normally conflicting interpretation is supported. At time \(t_3\), this alternative interpretation wins out. The key aspect of the model, however, is that the long-term expectation continues to support the initial interpretation in the face of the final interpretation; the art of the joke is to force one to the alternative view despite this expectation (cf. Martindale’s 1984 claim that aesthetic pleasure is a defiance of inhibitory action in the brain). This results in the joint maintenance of the conflicting interpretations at time \(t_2\).

The corresponding causal network is formed by a counterfactual methodology; that is, the causal influence of a given unit on any other unit is presumed to be the difference in absolute value between the current value of the second unit and this value if the first unit were lesioned, or not present. The sequence at the bottom of Figure 1 shows the consequence of this definition for the current situation. At time \(t_1\), each of the units in the initial interpretation support each other and thus causally influence each other; likewise for those in the final interpretation at time \(t_3\). However, during the transition period at \(t_2\) the mutual activation of both interpretations means that each is influencing the other via lateral inhibition, and this results in a temporary boost in causal activity in the network.

It is this boost, as per the Causal Principle of AE, that is hypothesized to result in the pleasure associated with resolving a joke. The graph in Figure 2 shows the size of this boost for both the connections between interpretations and over the entire network as a function of the expectation strength. Shown is the total boost, over the entire network, and the boost due to the increase in lateral causal activity between the two interpretations. It can also be seen that this lateral boost represents the largest portion of the total boost. Assuming the validity of the Causal Principle, this implies that humor works by inducing an additional causal interaction not present under ordinary stimulus conditions (unless both interpretations are jointly active, there will be little causal interaction between them).

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\(^{30}\)Although it is worth mentioning that this joke captures in concise format the importance of consciousness in understanding pleasure and thus get an additional “kick” by impugning the views of the psychologists.
Conclusions

Theories of aesthetics are at a crossroads. They can either embrace consciousness, or continue with a purely behaviorist/cognitive slant. The advantage of the latter path is both methodological and empirical simplicity. But the argument from zombies should give researchers pause that this is the proper way of moving forward. As in many areas, however, we are presented with both a problem and an opportunity. The incorporation of models of consciousness into a theory of aesthetics has the opportunity to enrich both fields. This paper has suggested one such integration, although it is likely that future research will augment or modify this suggestion.

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Aesthetic Evaluations of Literary Genres: An Exploratory Study

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Abstract

How do readers verbally capture aesthetic properties of literature? Our study investigated the conceptual structure of the perceived aesthetics of literary texts, using an approach introduced by Jacobsen et al. (2004). 1544 students were asked to write down adjectives labeling aesthetic properties of either literature in general or one of five sub-samples (novels, short stories, poems, plays, comedies). According to our analyses of frequencies, mean list ranks and the Cognitive Salience Index, ‘beautiful’ and ‘suspenseful’ ranked highest overall. Sample-specific terms included select emotion words for plays/comedies, cognitive-affective terms for novels/short stories, and music-related terms for poetry. A comparison of our results with similar studies for visual aesthetics and music revealed several overlaps, most notably regarding descriptions of poetry and music.

Keywords: Aesthetic evaluation; literature.

Research on the aesthetic qualities of literary texts frequently limits its focus to ratings of liking, beauty, and pleasantness of a text. While these aspects are certainly highly significant to the aesthetic appreciation of literature, there is very little insight into additional aesthetic notions readers may consider relevant for the evaluation and description of literary works. To shed light on this issue, we conducted a study investigating the conceptual structure of the aesthetic appeal of literature. Our approach follows the lead of three studies from the fields of visual aesthetics (Augustin et al., 2012; Jacobsen et al., 2004) and the aesthetics of music (Istok et al., 2009), which collected and analyzed terms used by test persons to describe the aesthetic properties of their chosen research objects. Using a very similar approach to gather data regarding aesthetic evaluations of literature allows us to contrast our own findings with the extant results pertaining to visual aesthetics and music, and therefore to contribute to mapping out the larger field of describing aesthetic objects.

In our study, 1544 students were asked to write down adjectives they use to describe or evaluate the aesthetic appeal of literature in general, or of one of five literary genres in particular (novels, short stories, poems, plays, and, specifically, comedies). Analyses of the frequencies, mean list-ranks and the Cognitive Salience Index revealed the terms ‘beautiful’ and ‘suspenseful’ to be the most frequently mentioned. Comparing the sets of terms used to describe different genres, we found a number of specific differences, including the significance of select emotions for plays and comedies (‘sad’, ‘amusing’), of cognitive-affective states for novels and shorts stories (‘suspenseful’, ‘interesting’), and of music-related notions for poetry (‘rhythmic’, ‘melodious’). A multidimensional scaling revealed that the aesthetic appeal of literature can be modeled on two dimensions, with the first one differentiating between narrativity and conceptuality on the one hand and poeticity and musicality on the other, and the second between intellectual and emotional states.

In a further step, we are comparing the frequency pattern of the aesthetically evaluative adjectives regarding literature with those identified in the above-mentioned studies by Augustin, Jacobsen, and Istok, to reveal several relational aspects between the descriptions of literature and other aesthetic objects, most notably between poetry and music.

We expect our study to shed further light on the field of aesthetic evaluation by adding insights into descriptions of literature. However, we do not only provide information regarding the aesthetic qualities readers expect from and attribute to literature and its individual genres, but also contribute to identifying a frame of reference common to a relatively large number of readers, which will prove useful for the creation of psychometric scales for reliable and valid assessments of the aesthetic properties of literature.

References


Emotional Processing in Music

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Abstract
Music is able to communicate emotions and general ideas in a non-symbolic way. Music can be explained as motion in tonal space that is defined by a tonal system of reference—musical scale. One of the main expressive aspects in European musical tradition is reorientation of a scale on different tonal centers or tonal modulation. We conducted two experiments to investigate affective response to modulation by using semantic differential related to valence, synesthesia, potency, and tension. The results revealed the affective influence of degree of modulation, of the major and minor modes, and melodic direction. We also found refined sensitivity of non-musicians to musical styles. The results offer support to Susanne Langer’s idea that music recreates the “logic of emotion.”

Keywords: tonal space; emotion; music cognition; affective neuroscience; synesthesia; aesthetic pangeometry

Introduction
According to Russian philosopher Pavel Florensky, a force field of beauty is as real as a force field of a magnet (Florensky, 1925). In his essay on time and spatiality in the representational arts, Florensky attempted to apply the concept of mass-energy equivalence from Einstein’s general theory of relativity to the explanation of psychological processes.

The idea of dynamic field is particularly valuable for our understanding of aesthetic emotion in music, because tonal space of music can be visualized as a force field defined by the hierarchy of tonal attraction. There are two main dimensions in the art of music—the space of phenomenal tonal gravity (Scruton, 1997) and structured time; together these two dimensions constitute the tonal chronotope.

Music perception is pattern recognition within a tonal system of reference or musical scale (Fig. 1). A scale is the hierarchy of tonal attraction to a stable tonal center, tonic. (Imagine a solar system with the Sun-tonic in a center and other notes as planets on different distances from the Sun). The dominating tonal schema today is the diatonic scale consisting of seven diatonic and five chromatic steps (Fig. 2).

Figure 1: In a C major scale, the leading tone B is strongly attracted to tonic C. The potential tonal energy of the leading tone creates the sense of melodic motion.

The mathematical limit to the problem of tuning was achieved in equal temperament that equalized the relationship between any two neighboring keys on a clavier. This allowed any key to become the tonic of the major or minor scales. Similar to the rationalization of visual artistic space through the introduction of linear perspective, the rationalization of the artistic space of music was a reaction to changing mental sets and to reassessment of a man’s place in the Universe (Veltman, 1981; Taruskin, 2001). The sonic ugliness of tempered scales was compensated by new expressive and structural possibilities, including the formation of the language of tonal harmony, the emergence of new complex musical structures (such as fugue and sonata allegro form), and freedom for tonal modulation.

The origin of the musical scale can be found on the intersection of the physics of sound and human neurobiology. Any naturally produced sound is actually a chord made of a fundamental sound and overtone series (Helmholtz, 1890). The majority of people do not hear the overtone series consciously, but it seems that our auditory system is able to detect and calculate the relationships between overtone series of different sounds. For example, the tones of the sonically pleasing Pythagorean intervals share their strongest overtones and this sharing of the important spectral information makes the Pythagorean intervals easier for the auditory system to process. The differentiation of melodic relationships on the pleasant consonants (requiring less neuronal cost for processing) and tense dissonant compounds (demanding greater neuronal cost) is the source of the tonal hierarchy. The differences in the cost of neuronal processing most likely generate the gradient of tonal tension. In other words, the hidden dimension of overtones makes the foundation for the sound patterns that we know as music. Studies show that human beings are sensitive to changes in tonality and to dissonant and consonant sounds at birth (Perani et al, 2010). We can say that people are born with intuitive understanding of the tonal relationships and basic melodic elements, which explains the universal accessibility of music.

The development of European musical tradition led to tempering with the hidden dimension overtones, a process which was similar to a “systematic abstraction from psychophysiological space” in visual arts due to the introduction of linear perspective (Panofsky, 1925). In the middle of 16th century Europe, a search for greater expressiveness led musicians to the novel ways of melodic thinking that demanded the freedom of motion in tonal space. Specifically, the musicians desired the freedom of moving from one tonal center to another within the same composition (the reorientation of a scale from one tonal center to another is called tonal modulation). There was a problem however: the freedom of tonal modulation required invariance of melodic intervals across the clavier keyboard, which would result in a systematic mistuning or tempering the musical scale (Schulter, 1998).

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Development of the language of tonal harmony led to reduction of six Greek modes to just two, Ionian and Aeolian, which are known today as the major and minor modes (Cazden, 1954; Trochidis & Bigand, 2013). The relationships between various musical chords became eventually crystallized into a terse formula of functional harmony, capacity and precision of which are reminiscent of Newton’s laws of motion in physics. This formula—a progression of triads on the diatonic steps I, IV, V, I—defines the language of harmony that dominates the world of music today.

Though music is often called a language of emotions, scientific understanding of affective responsiveness to music is still limited. The difficulties in studying emotion in music are caused mostly by the nonrepresentational nature of music. The selection of tonal modulation for our research was dictated by several factors. Musicological literature recognizes tonal modulation as one of the main expressive and structural aspects of music (Rosen, 1972), and it is well known from musical practice that modulations can produce characteristic responses. Moreover, thinking about music as motion in tonal space brings into focus the importance of understanding the emotional loading for different tonal distances. Studying the responses to modulation offers an opportunity to explore affective influence of specific tonal distances.

Music arrives in our perception as an artful arrangement of musical sounds along the arrow of time. With regard to melodic thinking, the meaning of sounds is determined by the intensity of perceived tonal tension that depends on proximity to a tonal center (Toiviainen & Krumhansl, 2003; Lerdahl & Krumhansl, 2007). Since music is made of tonal distances arranged in time, studying affective responses to motion on different tonal distances leads to the heart of emotional processing in music. Tonal modulation allows the researcher to study tonal distances “in vivo”—not just as a given melodic interval, but as a result of movement between point A to point B in a tonal space during reorientation of a system of reference (scale) from one tonic (A) to another tonic (B) in the course of a meaningful musical phrase.

Study in emotional responses to motion in tonal space of music

We conducted two experiments to investigate affective responses to different degrees of modulation by using bipolar adjective scales related to valence, synthesis, potency, and tension (Korsakova-Krey & Dowling, 2014). The experiments allowed us to explore emotional responses to motion in tonal space on different distances.

Method

The participants in the study were non-musicians (male and female students of psychology at the University of Texas at Dallas). Experiment 1 examined affective responses to smooth modulation to all 12 major and minor keys using 48 brief harmonic progressions (Fig. 2). Experiment 2 examined responses to three most popular degrees of modulation, the subdominant (step 5), the dominant (step 7), and ascending minor sixth (step 8), using a set of 24 controlled harmonic progressions and a balanced set of 24 excerpts from piano compositions belonging to the First Viennese School and the Romantics. In addition, Experiment 2 investigated the affective influence of melodic direction in the controlled harmonic progressions. The participants were asked to indicate the intensity of their affective responses to the concluding part of each stimulus on six bipolar adjective scales.

![Figure 2: The numbering of degrees of modulation (target-tones) in the C major tonality. For the C major scale, the white keys represent diatonic steps (0, 2, 4, 5, 7, 9, 11) and the black keys represent chromatic steps (1, 3, 6, 8, 10).](image)

Results

The obtained data were subjected to principal components analysis (PCA) and analysis of variance (ANOVA). The results of Experiment 1 agreed with the theoretical model of pitch proximity based on the circle of fifths and demonstrated the affective influence of degree of modulation and the major and minor modes (Fig. 3, see end of paper). The listeners recognized the most important degree of modulation to the subdominant (5) and dominant (7) steps, both of which are close in key proximity, and they sensed the popular modulation to step 1 and step 8 in a major mode.

The clearly negative feeling about modulation to the dominant in a minor mode demonstrates the listeners’ sensitivity to violation of the rules of classical functional harmony; the rules demand that the dominant triad was in a major mode in order to utilize the intense perceived tension of the leading tone (Schoenberg, 1954/196). The participants indicated their positive feelings about popular distant modulation in a major mode to steps 1, 11, and 8, and the participants indicated negative feelings about modulation to the distant tritone (diabolus in musica, step 6) and the flattened leading tone (step 10).

The responses to all distant modulations grouped themselves into “pleasant surprise” and “unpleasant surprise.” The qualitative analysis suggested that the feeling of pleasantness was related to mutually “leading” qualities of the opening and concluding tonic triads in modulation to step 1 and step 11, and to “pseudo-stability” provided by a tonic of the opening tonality when the tonic became a mode-defining third in the concluding tonic triad for modulation to step 8 (Fig. 4). The differences in responses to the distant modulations show that there are factors other than key proximity, which influence the affective perception of motion in tonal space.
Figure 4: Classification of “pleasant surprise” modulations: Sliding type is defined by approaching semitones (a and b). Pseudo-stability type converts a tonic of the Opening tonality into a mode-defining third of the Concluding tonality and vice versa: c and d.

The results of Experiment 2 revealed that the modulations to the distant step 8 were perceived as the “tensest” in comparison with the modulations to the close step 5 (the subdominant) and step 7 (the dominant). Modulations to the subdominant were recognized as “weaker” than modulations to the dominant both in the harmonic progressions and the real music excerpts; this finding agrees with the musicological research (Ribeiro-Pereira, 2004).

There was greater differentiation of the modulations in the real music excerpts as compared to the uniform harmonic progressions, which indicates that the expressiveness of real music strengthens the sense of perceived key proximity (Thompson & Cuddy, 1997). The study discovered that perceived increase in tension was associated with an increase in negative valence on the quasi-synesthetic scales warm/cold and bright/dark. This discovery posts an interesting question concerning the possibility of universal presence of quasi-synaesthetic experience during music perception.

In addition, we found an affective influence of melodic direction and an interaction between melodic direction and degree of modulation for the close modulations to step 5 and step 7 but not for the distant step 8, which suggests that the influence of key distance overwhelmed the influence of melodic direction. As an empirical confirmation of one of the effects known a priori in the vocal arts, the results demonstrated that an increase in perceived tension for the rising melodic direction in soprano and bass lines was associated with the “happier,” “brighter,” “warmer,” “firmer,” and “stronger” ratings in modulations to the dominant.

With regard to aesthetic emotion, one of the most fascinating findings of our research was the refined sensitivity exhibited by non-musicians to two historically proximal musical styles, Classical and Romantic (Fig. 5). Moreover, the results suggest that the participants intuited Schubert’s music as transitional between the Classical and Romantic periods.

Discussion

The presented study was the first of its kind (original study) in exploring the connection between emotion and reorientation of a tonal system of reference on different distances in a tonal space. The research design of Experiment 1, which included musical phrases modulating to all available degrees and in all available major and minor conditions, allowed us to obtain a map of responses, which essentially agrees with the accepted tenets of functional harmony. The perceptiveness of non-musicians to the fine details of tonal space and the surprising sensitivity of non-musicians to historically proximal musical styles each indicates the high degree of implicit musical expertise among the participants, none of whom were trained musicians. With regard to musical expertise, the results of our study suggest a more charitable explanation of music perception as compared to Leonard Meyer’s ideas about trained expectations in music listening (Meyer, 1956).

The spectacularly primitive character of the main morphological principle in music, perceived tension, emphasizes the essentially intuitive nature of music perception. This understanding—and the research in cognitive and affective neuroscience by Alexander Luria (1970), Antonio Damasio (1996), and Jaak Panksepp (1998, 2004)—became the basis for our archaic model of emotional processing in music.

The archaic model proposes that the main morphological principle of music, perceived tension, mimics and embodies the most primitive reactions of the living organism to its environment; these primitive reactions are tension and release. The sensation of perceived tension (stability and instability) in tonal music goes directly to our primeval neurobiology, specifically to the “virtual self” (“proto-self”)
situated in mesencephalon, where all immediate reactions on
the environment (both internal and external), are integrated.
The artful sequencing of these sensations by means of
musical sounds can generate psychological states, namely, a
particular arrangement of tones along the arrow of time can
elicit specific emotional response by recreating the logic of
emotion (Langer, 1942).

Bringing together the concept of phenomenal tonal gravity
and the hypothesis of the gradient of neuronal cost of
auditory processing for melodic elements makes tonal
composition into an image of configuration of energy
distribution (the hypothesis of the neuronal cost of auditory
processing received tangential evidence in EEG study by
Bideman & Krishna, 2009). Connecting perceived tension in
music with the concept of a dynamic field transports the
research in music perception to the forefront of empirical
research in aesthetic emotion and neurophysiology of human
cognition (Prigogine, 1997; Buzsaki, 2006; Fingelkurts
& Fingelkurs, 2013).

Unlike basic emotions, aesthetic emotion is purely human
experience that involves the presence of beauty (Florensky,
1925), cultural construct (Stevens, 2012), non-pragmatic
interest (Scherer & Zentner, 2008), and personal subjective
experience (Vuokskoski & Eerola, 2011). Florensky’s
proposal that formation of aesthetic emotion in the perception
of representational arts involves changes in velocity of
perception, which affect psychological state, offers a novel
approach by treating aesthetic emotion as a product of artistic
pangeometry (in the general theory of relativity, the curvature
of space can be equated with gravitational acceleration).
Music offers a unique area of study in artistic pangeometry
because in music the obvious presence of a dynamic field
(phemonenal tonal gravity) is combined with the limited
number of basic tonal elements (seven diatonic and five
chromatic tones). This combination could be instrumental in
creating a mathematical model of melodic structures and
their transformations that are conceptually similar to
visuospatial transformations (D’Arcy Thompson, 1917;
Shepard & Cooper, 1982). Empirical research in music
perception could also lead to construction of the multimedia
form, in which music is produced with the help of data
obtained in studies in the perception of motion in tonal space.

Conclusion
Introduction of the idea of a dynamic field in order to explain
emotion in music creates interesting connections between the
theoretical studies in the fine arts and the empirical research
in psychology and cognitive neuroscience. Such
interdisciplinary integration promises to enlighten our
understanding of aesthetic emotion.

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Figure 3: The affective influence of degree of modulation and the major and minor modes. The important dominant (7) and subdominant (5) steps were well differentiated. The participants recognized the popular degrees of modulation in a major mode to step 8 and step 1. Triads in the major mode (red and yellow symbols) are mostly on the side with the positive connotations (happy, pleasant, bright, and warm), whereas triads in the minor mode (black and blue symbols) are mostly on the negative side (sad, unpleasant, dark, and cold).
Pixel Drawing: A Novel Signal Detection-Based Approach to Measuring Drawing Skill

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Abstract
Psychological studies of skilled artistic drawing have traditionally relied on subjective Likert-scale ratings to assess drawing accuracy, a significant methodological limitation. Here we used a novel and objectively scorable ‘pixel’ drawing task to explore psychological accounts and expertise effects in drawing. A total of 18 artist and 27 non-artist participants created drawings by placing 225 small squares of black tape within a 28 x 32 grid superimposed on a photograph of a face. A signal detection analysis comparing square placement in each drawing with that of a computer-generated version of the image revealed a very large artist advantage in sensitivity to placing the squares appropriately. Subjective accuracy ratings by 8 artist and 25 non-artist judges yielded a pattern whereby artists’ ratings of other artists’ renderings were rated as considerably higher than any of the other three drawer-rater combinations. This method provides a means for further integrating bottom-up and top-down explanations of drawing skill.

Keywords: drawing skill, signal detection theory, visual art, bottom-up and top-down perception.

Introduction
In recent years, the venerable question of the nature of artistic drawing skill has become the focus of a number of psychological investigations (e.g., Cohen & Bennett, 1997; Kozbelt, 2001; Kozbelt, Seidel, ElBassiouny, Mark, & Owen, 2010; Ostofsky, Kozbelt, & Seidel, 2012; Perdreau & Cavanagh, 2011, 2013), which have explored many methodological and conceptual issues.

Throughout this work, several different perspectives have been advanced to account for artists’ advantages in representational drawing (summarized in Kozbelt et al., 2010; Ostrofsky et al., 2012). One, sometimes termed the bottom-up perspective, emphasizes early perceptual biases as the primary source of drawing errors and is related to the classic Fry-Ruskin notion of the ‘innocent eye.’ In this view, conceptual knowledge has an interfering effect on veridical perception; the best remedy is to forget what one knows about an object when drawing it. Several studies (e.g., Cohen & Bennett, 1997; Mitchell et al., 2005) have found evidence supporting this view.

In contrast, the alternative top-down view argues that no eye is truly innocent, and that knowledge of the structure of objects is useful and indeed necessary for the creation of realistic 2D depictions of the 3D world. Gombrich (1960) famously pointed out some key limitations of the bottom-up perspective – namely, the need for careful selection of important visual information to include in a convincing depiction, in order to overcome the inverse problem in vision, whereby an infinite number of 3D environments can give rise to any one particular 2D projection. Empirical evidence supporting Gombrich’s claim has come mainly from studies using limited-line tracing tasks, which carefully control for the amount of line available to use in a rendering. For instance, Kozbelt et al. (2010) found that artists produce significantly better depictions of faces than do non-artists, when both groups are given very limited means of production. Ostrofsky et al. (2012) obtained similar results for depictions of elephants, as well as finding that artists spontaneously deploy more line junctions in their depictions, which are useful for conveying a sense of 3D form (see also Biederman & Kim, 2008; Hamm, 1963)

While the use of limited-line tracing tasks has provided novel types of evidence bearing on drawing skill, this approach is still methodologically limited in relying on subjective ratings of accuracy, which are not always completely straightforward – for instance, Kozbelt et al. (2010) found that artists’ depictive advantages in the limited-line tracing task were far stronger when the images were judged by other artists, rather than by non-artists. Moving this line of research forward would be greatly helped by using a task lending itself to more objectively scoring (see, e.g., Ostrofsky, Cohen, & Kozbelt, in press).

In the present study, we introduce such a task. This pixel-drawing task has many desirable features that would substantially increase the methodological sophistication of studies of drawing skill. In other limited-line tracing tasks, the lines themselves may be used in many different ways,
placed at various orientations, bent, and so on. Replacing lines with squares (or pixels) placed in a grid obviates these issues of depiction, while preserving the many virtues of earlier limited-line tracing tasks: chiefly, forcing the issue of careful visual selection, equating the total amount of line used by each participant, and being able to focus on aspects of the image other than proportions, since the depiction is a tracing (Kozbelt et al., 2010). Superimposing a standardized grid on a reference image (here a face, as in Kozbelt et al., 2010), where each square may be either black or white, allows for objective binary coding of each part of the depiction. Moreover, the reference image can be processed via image manipulation software to preserve the position, coarseness, and size of the grid, as well as the number of black versus white elements in the image, and this can then serve as the ‘correct’ answer (at least in bottom-up terms).

The accuracy of each depiction can be assessed relative to the transformed reference image and objectively scored using signal detection theory (see Macmillan & Creelman, 1991). The most relevant metric here is $d' \text{ -- the standard measure of sensitivity in signal detection theory -- which indicates the separation of signal from noise, and which is computed using hit and false alarm rates.}$ The $d'$ of each depiction indicates the extent to which a participant is perceptually sensitive to selecting the correct squares of the grid to fill in; a higher $d'$ indicates greater overlap with the correct answer. Thus $d'$ can serve as an ideal objective metric of drawing performance in this task. Objective ratings can also be compared with subjective ratings, to examine their correlation, as well as to identify aspects of the images that may frequently depart from the correct answer, and to examine performance differences between artists and non-artists.

Besides its methodological utility, a pixel-drawing task is also interesting from a theoretical perspective, in bearing on bottom-up versus top-down accounts of realistic depiction in novel ways. Previous research exploring the relative predictive power of these two frameworks (Ostrofsky et al., 2012) tended largely to equate bottom-up accounts with overcoming perceptual constancies in computer-based perception tasks (e.g., McManus et al., 2011; Perdreau & Cavanagh, 2011) and top-down accounts with visual selection, evident in superior performance on limited-line tracing tasks (e.g., Kozbelt et al., 2010). However, the present pixel-drawing method combines aspects of both accounts into a single task: top-down visual selection in the choice of which squares to fill in, and the use of a bottom-up-transformed reference image serving as a ‘correct’ answer. Comparing the performance of artists versus non-artists on both objective and subjective indices of drawing accuracy, and identifying how each group may depart from the correct answer in their depictions, would likely yield a more integrated perspective on drawing skill than considering bottom-up and top-down accounts in isolation.

31 The other primary measure in signal detection studies, the response threshold criterion, $\beta$, is not relevant here, as each participant was constrained to use the same number of dark versus light squares in the depiction.

32 An image of the original photo may be found at the far left of http://www.simonhoegsberg.com/faces_of_new_york/index.htm

33 We note that the particular image that emerged from this process was quite sensitive to exactly how the image was cropped, the coarseness of the mosaicking, and the total number of pixels, such that small changes on any of these significantly impacted the apparent realism of the image. Since our goal was to have a valid objective measure of the convincigness of participants’ depictions, it was important that the ‘correct answer’ image be as realistic as possible (while not requiring so many squares as to make the task unmanageable). To this end, we generated numerous variations of the image, noting the procedures for creating each image in great detail, and finally settling on the version that we thought best captured the original photo. While arguably this introduces a subjective element into the materials and task, the key point is that once the basic parameters of crop and coarseness were determined, the Photoshop thresholding tool, which determines the cut-point for making a particular pixel black or white, is uni-dimensional and deterministic. In other words, given a particular cropping and pixel size, the thresholding tool yields an image that is ‘correct’ in a bottom-up algorithmic sense, revealing (in our case) which 225 of the 896 pixels correspond to the darkest areas of the original image. The transformed image can thus serve as a legitimate ‘correct answer’ standard against which participants’ depictions can be objectively compared using a signal detection framework. Note finally that there is nothing particularly significant about the fact that 225 squares were black – this is merely a consequence of the
Each participant was given a copy of the cropped photo printed on an 8.5 × 11-in. piece of white paper placed in portrait orientation inside a clear plastic folder; the printed photo measured 15.4 × 17.6 cm. Thin grid lines were drawn in black pen directly on the printed photo, and a border was drawn in black marker directly on the clear plastic folder, to keep the gridding consistent if the photo moved around slightly within the folder. The cropping and gridding of the photo exactly matched that of the ‘correct answer’ image (as described in Footnote 2). Figure 1 shows the original stimulus photo and the ‘correct’ answer as generated in Adobe Photoshop.

![Figure 1: Original stimulus photo and ‘correct’ answer.](image)

Participants were also given an un-gridded printed copy of the photo as an additional reference image and an 8.5 × 11-in. piece of white paper to slide between the gridded photo and their emerging drawing on the plastic folder, so that they could see what their depiction looked like without interference from the photo beneath. Participants were also provided with exactly 225 squares of black tape stuck to a plastic surface. Each square measured 0.55 cm on a side.

**Procedure** Each participant was tested individually. Participants were instructed to use the available squares to create a drawing of the face that was as accurate as possible, given the constraints of the medium. Accurate realism, rather than creativity, was explicitly emphasized. Participants were required to use all 225 squares and to place them so that each square unambiguously filled up exactly one square of the grid. Participants were told that they were allowed to change the location of pieces already put down, so that the final image was as satisfying as possible. Suggested work time was one hour, but participants were told that it was more important that they be happy with the depiction than that they strictly observe a time limit.

**Judgment Task**

**Participants** Thirty-three individuals participated: 8 artists (2 females, 6 males), \( M (SD) \) age = 27.1 (4.5) years, and 27 non-artists (18 females, 9 males), \( M (SD) \) age = 20.7 (4.1) years. Group membership definitions and compensation were the same as in the Pixel Drawing Task.

**Materials and Procedure** Judges assessed the accuracy of 48 images: the 45 depictions produced in the Pixel Drawing Task, the ‘correct answer’ image, and two prototypical images (one for artists and one for non-artists). Prototypes were generated by summing the frequency with which each cell was covered with a tape square across the relevant depictions and then filling in the 225 most frequently selected cells. For both prototypes, a number of cells around the threshold had an equal frequency count; these ties were broken by randomly choosing enough of these cells to make a total of 225 black pixels in each prototype. Thus all 48 images in the rating task had exactly the same number of black versus white pixels.

To standardize the presentation of the depictions and make the rating task easier, each was converted into an image in Microsoft Excel by filling in the relevant cells in an Excel worksheet either black or white. Each image was shown on a separate worksheet within a single Excel file, standardized with each cell 20 pixels wide and 20 pixels high, and shown at 80% zoom so that each image would fit on the screen in its entirety when the file was opened. Each image was shown on a separate worksheet within a single Excel file, with the Rating Task survey for that image included on the same worksheet. The bottom tab of each worksheet included a random six-digit number as an identifier for the depiction. The order of the worksheets within the Excel file was randomized; five versions of the file were used across raters.

Participants completed the survey by typing their responses next to each survey item. The items were: proportions are accurate, sense of 3-D form is strong, drawing is recognizable as a face in general, choice of pixels to darken is good, drawing is surprising, drawing is recognizable as the specific face in the photograph, emotional expression is convincing, artistic quality is high, and overall accuracy is high. Ratings were given on 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). All raters judged all depictions.

**Results**

**Signal Detection Analysis**

A total of 47 images (the 45 images produced in the Pixel Drawing Task plus the two prototype images) were first analyzed by signal detection theory. Specifically, for each image, we computed a hit rate (i.e., which proportion of the 225 cells that should have been filled in were actually filled in) and a false alarm rate (i.e., which proportion of the 671 cells that should not have been filled in were actually filled in). Hit and false alarm rates, \( z \)-transformed (see Macmillan & Creelman, 1991, p. 318), were then used to calculate each participant’s sensitivity to the correct positioning of the pixels, or \( d' \).

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34 Because the ‘correct answer’ image itself represents perfect performance, we could not compute a value of \( d' \) for it.
A comparison of the $d'$ values of artists and non-artists revealed a highly reliable difference, $t(43) = -6.97$, $p < .001$, Cohen’s $d = 2.15$, a very large effect size, $M (SD)$ $d'$ values = 1.76 (0.46) and 0.96 (0.30) for artists and non-artists, respectively. Given a slight violation of homogeneity of variances, we also compared the two groups non-parametrically using the Mann-Whitney $U$ test; the effect held, $z = -5.03$, $p < .001$. Thus, artists show a tremendous advantage in their sensitivity to which areas of the image (i.e., pixels or cells of the grid) should be darkened in. Sample images by artist and non-artist participants, including $d'$ values for each image, are shown in Figures 2 and 3, respectively.

![Figure 2: Three depictions by artists.](image)

![Figure 3: Three depictions by non-artists.](image)

### Analysis of Subjective Ratings

Ratings by artists and non-artists were refined by Rasch statistical analysis (Rasch, 1960/1980; Wright & Masters, 1982). By taking into account the pattern of responses across individual survey items and individual respondents, Rasch analysis constructs an interval-scale metric of the construct of interest (here, the accuracy of the drawings) via an iterative, maximum-likelihood process. If a coherent dimension exists the overall analysis will converge into a stable pattern; if no coherent dimension exists, the analysis will fail to converge. Importantly, the analysis also reveals the extent to which individual survey items fit onto the underlying dimension and thus allows the elimination of ill-fitting or non-representative items.

Data from artists and non-artists were Rasch-analyzed separately. In each group the analysis successfully converged, indicating a stable underlying dimension of accuracy; moreover, the same three ill-fitting survey items (drawing is surprising, drawing is recognizable as the specific face in the photograph, and emotional expression is convincing) were deleted in each group to refine the measurement of accuracy.

Across all drawings, Rasch ratings by artists and non-artists were strongly correlated, $r(31) = .76$, $p < .001$, indicating that artists and non-artists largely shared a sense of the relative accuracy of the depictions. However, several additional results provide some nuance to this basic conclusion. First, correlations between $d'$ values and average subjective ratings were numerically higher for artist judges, $r(45) = .651$, $p < .001$, than for non-artist judges, $r(45) = .396$, $p < .001$.

In addition, we also examined the effects on accuracy of drawer and judge group and their interaction, with the Rasch accuracy score as the dependent variable. A 2 (artist vs. non-artist drawers) × 2 (artist vs. non-artist judges) mixed-model ANOVA was then performed, treating drawer group and judge group as fixed variables and particular drawings and judges as random variables. Because the general linear model for the analysis did not yield valid error terms for directly computing $F$ ratios for the comparisons of interest, quasi-$F$ tests were used. Because of relatively low statistical power (given only 8 artist judges), overall main effects for rater group and judge group were not statistically reliable at the .05 level. However, a marginally reliable interaction between drawer group and judge group was found, quasi-$F(1.13, 55.55) = 2.82$, $p < .10$, $\omega^2 = .031$. This interaction was due to differences in the sensitivity of the two rater groups to the accuracy of the drawings made by the two groups in the drawing task. Specifically, a comparison of artists’ versus non-artists’ drawings, as judged by artists, showed a stronger difference in accuracy judgments, quasi-$F(1.06, 34.65) = 4.02$, $p = .05$, $\omega^2 = .031$, with artists outperforming non-artists, $M (SE)$ accuracy = 61.6 (1.7) and 52.8 (1.6), for artists’ and non-artists’ drawings, respectively. In contrast, a comparison of artists’ versus non-artists’ drawings, as judged by non-artists, showed no difference, quasi-$F(1.47, 66.71) < 1$, $ns$, $\omega^2 = .000$, $M (SE)$ accuracy = 50.3 (1.0) and 48.5 (0.8), for artists’ and non-artists’ drawings, respectively. Overall means for each drawer-judge group are plotted in Figure 4.

![Figure 4: Mean ratings by drawer and judge group. Judgment scores are given in logits, the unit of the Rasch output, where a higher score represents higher accuracy.](image)
Discussion
The goal of this study was to build on previous research investigating the psychological nature of drawing skill. Specifically, we examined the role of visual selection in skilled drawing, building on earlier limited-line tracing tasks (Kozbelt et al., 2010; Ostrofsky et al., 2012) by implementing a more objective version of such a task, in which participants filled in a set number of squares to depict an image, rather than laying down lines in various orientations. This method allowed a completely objective assessment of the accuracy of each depiction relative to an objective, computer-generated standard via signal detection theory, as well as by traditional subjective accuracy ratings.

The basic results were clear. Artists showed a strong advantage over non-artists in sensitivity ($d'$) to the correct placement of the dark squares in the image. Consistent with earlier studies using limited-line tracing tasks, this implies that artists are better than non-artists at astute visual selection in the context of representational depiction.

These objective $d'$ results were corroborated by our findings for the subjective accuracy ratings. Despite relatively low power, our judgment task results largely replicated Kozbelt et al.’s (2010) findings, whereby artists’ depictions were judged as more accurate than those of non-artists, particularly when assessed by artist judges. This indicates that not only are artists more sensitive than non-artists to the proper placement of dark areas of an image, but that they are also more sensitive to others’ decisions as well. This point is underscored by our correlational results, whereby artists’ subjective ratings were numerically more strongly correlated with the $d'$ values than were non-artists’ ratings. All told, these findings provide further empirical support for Gombrich’s (1960) contention about the importance of top-down selection as a key element of depictive skill (as in Kozbelt et al., 2010).

However, the results also inform the relation between bottom-up and top-down accounts of drawing skill (as in Ostrofsky et al., 2012). Previous studies (e.g., McManus et al., 2011; Ostrofsky et al., 2012, in press; Perdreau & Cavanagh, 2011) have typically operationalized bottom-up accounts of drawing skill in terms of overcoming perceptual constancies like shape constancy or size constancy; however, in the present study, the bottom-up aspect of the task is represented by the algorithmic conversion of the baseline photographic image into the ‘correct’ answer in Figure 1. In one sense, artist’s higher $d'$ scores could be interpreted as a basic bottom-up advantage in simply noting which pre-gridded squares on average contain the darkest regions of the image – a characterization that departs from the traditional bottom-up view mainly involving overcoming perceptual constancies involving shape and size.

The bottom-up aspect of the pixel drawing task is clearly evident in the dynamic of active selection to create the final depiction, as in previous limited-line drawing studies. Additionally, the pixel drawing task provides an opportunity to examine how artists may systematically deviate from the bottom-up signal to produce a more convincing or expressive depiction. This dynamic of the selection and enhancement of important visual features is perhaps most evident in caricatures, but it is a more or less universal requirement of realistic depiction (see Gombrich, 1960; Kozbelt & Seeley, 2007). Specifically, the pixel drawing task lends itself to an examination of how artists’ renderings may systematically depart from the ‘correct’ answer. For instance, compare the artists’ renderings in Figure 2 with the correct answer in Figure 1. The correct answer image lacks a few key characteristics of the original photo, such as the wrinkles between the woman’s eyebrows, an indication of her right eyelid, and a demarcation of the lower lip – all of which are present in the artists’ renderings in Figure 2 and arguably make these renderings more convincing and expressive copies of the original than the correct answer.

Future analyses will examine these differences in more detail. For the time being, however, it appears that the novel methodology of our pixel drawing task has great potential for further informing the nature of realistic drawing skill.

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References


Affective Tones: Emotional Classification and Aesthetic Appreciation

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Abstract
In my talk I will consider the phenomenon of phonological (hypo-) iconicity, often defined as “an inmost, natural form of association” (Jakobson, Waugh 2002: 182). 128 participants rated a content-controlled corpus of 48 German poems on emotional and aesthetic scales. Additionally, phonological analyses were conducted. The participants confirmed a phenomenological-based classification of the poems as either happy or sad, and showed preference for negative content in regard to aesthetic judgments. Also, participants perceived the happy poems as sounding significantly brighter and the sad poems as sounding significantly darker. However, this cannot be explained by the wide spread assumption that there is a higher frequency of front vowels in happy poems and a higher frequency of back vowels in sad poems.

Keywords: Phonological iconicity; emotions, poetry, aesthetic judgments; front and back vowels; sound qualities;
The Influence of Assignment of Authenticity on the Perception and Evaluation of Works of Art: An Eye-Movement Analysis

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Abstract
We examined the influence of experimentally manipulated assigned authenticity of paintings on viewers’ eye-movement scanning patterns and evaluative judgments of artworks by renowned artists.

Keywords: painting authenticity; eye-movement analysis; aesthetic evaluative judgments.

Research Overview
There are many examples in the art world of famous paintings that drop to almost no market value when it is determined that a work once thought to be the creation of a world renowned artist is shown to be the work of some other artist (e.g., the work of the master forger Han van Meegeren). Authenticity matters in the art world. There is only one authentic original or “true” version of any painting. On the other hand, there are a number of possible duplicate and forgery types of an original which range from repetitions of an original by its artist to copies or duplicates of various types made by another artist (e.g., apprentice copies, forgeries of an original). In addition fakes have been created that were recognized as originals by famous artists, only to be shown not to have been painted by them. Although there is a very extensive literature dealing with theoretical issues concerning the authenticity-aesthetic-monetary value of art, very few studies have examined this issue experimentally. This was the general purpose of the present study. It was designed to assess Newman and Blooms’ (2012) three psychological mechanisms underlying the special value of original artworks – assessment of performance, contagion, and intuitions about market value. We examined the influence of authenticity of paintings on viewers’ eye-movement scanning patterns and evaluative judgments of artworks. Specifically, 15 university students untrained in the visual arts and 15 art-trained individuals viewed a set of 30 paintings by well-known artists under one of three authenticity (cue) conditions: original, fake, and intentional copy of a master’s work done by a very talented apprentice taught by the artist to produce works in his various styles. Following unlimited viewing time for each painting participants rated it for pleasantness, overall aesthetic or artistic merit, and monetary value. Participants’ scanning patterns for each artwork were compared across the three authenticity conditions on a number of eye-movement parameters, some of which include total viewing time, number and duration of fixations, the attention directed to compositional elements considered to be key components of the painting’s structural organization, and the amount of overall coverage or exploration across the entire pictorial field. Additionally, these aspects of exploration were examined across the time course of each aesthetic episode.

Reference
Between Indifference, Devotion and Sexual Arousal: 
Emotional Experience of Art Audience Reflected through Appraisal Theory

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Abstract
This study examines the audience’s emotional experience of art through interviews conducted at the Munch Museum, Oslo. In the interviews, the participants reflect their emotions in the context of the iconic works of Edvard Munch. In a qualitative analysis of the interviews, attention is paid to the individual and cultural variations in the respondent’s emotional experiences, and the results are interpreted through appraisal-theory. The visual properties of the artworks are also discussed, for example, by making comparisons between the painted and lithographic versions of Munch’s Madonna and the audience’s experiences of these works. The results indicate how complicated the relationship between the work of art and the experiencing audience actually is. Both the personal experiences of the beholders and their cultural background interact with the visual properties of the artworks.

Keywords: Emotion, Expression, Experience, Appraisal, Visual Art, Munch

Introduction
The study of emotions has a long history in different disciplines. While psychology has traditionally focused on the natural symptoms of emotions, the humanist and social disciplines have been more interested in their conventional aspects. Furthermore, where psychologists have widely focused on universally shared basic emotions, in history, sociology and cultural studies more attention has been paid to the culturally and historically varying emotions. Besides cultural and historical differences in emotions, individual differences in the emotional experiences of people have been also recently investigated. (E.g., Averill, & Thomas-Knowles, 1991; Barrett, 2009; Fontaine, Scherer, & Soriano, 2013; Harding, & Pribram, 2009; Kuppens, Stouten, & Mesquita, 2009; Power, & Dalgleish, 1997.) The emotional expression of artworks has been studied in different fields of the humanities, like in art history. Art historians, however, have rarely approached the emotional experiences of the audience empirically – that is, through interviews, questionnaires or psycho-physiological methods. Therefore, the experiences of the art audience have traditionally played a marginal role in this field. The problematic of experiencing, in turn, has frequently been discussed in empirical aesthetics where people's emotional responses to visual art have been studied experimentally. As scholars like David Friedberg (1989), Derek Matravers (1998) and Noël Carroll (2001) have suggested, in the studies focusing on art and emotions, both our aesthetic and emotional concepts together with the properties of artworks that elicit the emotions should be analyzed.

In aesthetics, the nature of aesthetic emotions has been discussed. One of the most frequently discussed emotion concepts in aesthetics is aesthetic pleasure. It cannot be said, however, that there is some particular emotion or even a certain set of emotions that dominate the experiences of art. Art can arouse any emotion because people tend to associate personal meanings with everything they see and experience. “Garden-variety emotions”, marked in ordinary speech, can be separated from purely aesthetic emotions. (E.g., Carroll, 2001; Lazarus, & Lazarus, 1994.) In appraisal theory, emotions are differentiated by cognitive evaluations, and it is typically assumed that the cause of emotions is rather the interpretation of events than the events themselves. Because a certain event or a situation can be interpreted in various ways, different emotions can be experienced by the individuals who appraise the situation differently. (E.g. Roseman, & Smith, 2001.) Therefore, through appraisal theory it is possible to explain both individual and cultural differences, which have recently been widely discussed in the study of emotions.

Paul J. Silvia (2005) has discussed the explanatory power of appraisal theory in the context of art. According to him, the modern science of emotion, with its theories of appraisal, has much to offer to the study of aesthetics. The importance of appraisal theories, when compared with earlier theoretical approaches to the relationship between art and emotions, lies in the room it provides for individual differences. Beholders are not just passively perceiving art and emotionally responding to the visual stimulus it includes, but they actively interpret everything they see and evaluate the meanings of observed phenomenon through their earlier experiences. (Kuuva, 2007.)
In this paper, the relationship between the visual expression of emotions and the emotional experience of the audience is approached through Edvard Munch’s art. The results are interpreted using appraisal theory.

Methods

The experience of the audience is investigated through a series of interviews in the context of the original Frieze of Life works by Edvard Munch (1863-1944). The interviews were conducted at the Munch Museum in August 2011 in the exhibition, “Edvard Munch ...to explain to myself life and its meaning. Masterpieces”, (6 May 2011 - 21 August 2011).

Materials

The Interviews were conducted in the context of six works of Munch: The Scream (1910?), Angst (1894), Separation (1896), Eye in Eye (1899-1900) and two different versions of Madonna (1894, oil on canvas and 1895-1902, lithograph). In this paper, key attention is directed at the audience’s interpretations of Madonna. Because the Madonna of Munch has clear connections to religious imagery, it functions differently than other works of the artist. For example, the beholders compared Munch’s Madonna to religious art. That was not usually done in the context of other works.

As is well known, Munch made numerous versions of Madonna – drawings, graphic works and paintings. In addition to the five identified versions of the Madonna painting, there are various graphic versions of this motif (e.g., Woll, 2008/2009). In the different versions of Madonna, moderate variations in colors, forms and composition can be observed. Although there are many visual parallels between the painted and lithographic versions of Madonna, which were used as stimulus material in the interviews, there are also some interesting differences such as the figures of the embryo/fetus/child and sperm in the frame of the lithographic version.

The Madonna of Munch, which has been seen as an image of a woman either making love or giving birth, has been explained as portraying a combination of ecstasy and pain (e.g., Cordulack, 2002). The motif can be associated with the mystical-erotic cult of Madonna, starting from the Middle Age (e.g., Hofmann, 1983). There are many interesting connections between the Madonna of Munch and traditional religious motifs, such as Annunciation, Incarnation, Immaculate Conception and Mater Dolorosa. It is also worth noting that Munch combined elements of religious imagery with the contemporary scientific ideas such as the theory of evolution. As the artist himself explained, Madonna represented “the mystique of an entire evolution brought together” (e.g., Cordulack, 2002). In addition to the different phases of life, death is also present in the picture, for the head of the embryo in the lithographic version of Madonna is reminiscent of a skull.

The Madonna of Munch can, thus, be seen as a motif where the popular themes of the science of the late nineteenth-century, such as evolution, sexuality, ecstasy, fertility, conception, birth, pain and death, are linked to the long tradition of religious art. In general, it was typical for Munch to combine in his emotional expression the threads of traditional imagery with those of contemporary science. (Kuuva, 2010a; Kuuva 2010b.)

Participants

All in all there were 67 interviews conducted in the context of Munch’s works with interviewees from 21 countries. Most of the participants were foreign tourists. In August, when the interviews were conducted, there are typically only a few Norwegian visitors at the Munch Museum. The largest group of interviewees was from Southern and Central European Countries – especially from Italy, Spain, France and Germany, but there were also several Asian and American interviewees.

In the context of Madonna, 18 interviews were conducted, half of them in the context of painting and half of them in the context of lithograph. The interviewees were from 12 countries:

Painting: 9 interviewees: France (2), Italy (2), Norway (1), Spain (1), Romania (1), Taiwan (1), UK (1);

Lithograph: 9 interviewees: Australia (1) Germany (1), Italy (1), Japan (2), the Netherlands (1), Romania (1), USA (2).

In the context of the painting, 5 interviewees were females and 4 males, and in the context of the lithograph, 4 interviewees were females and 5 males. The age of the interviewees varied between 18 and 67 and the mean was 36 years.

The interests and attitudes of the respondents towards art in general and Munch as an artist varied greatly. Some interviewees had come to Oslo just because they wanted to see original works of Munch, while some others visited the museum as a part of their tour of either Oslo or Scandinavia. Therefore, among the interviewees, there were both interested and disinterested, or engaged and disengaged, individuals.

Procedure

In the semi-structured interviews, each interviewee was asked the same questions. First there were background questions concerning the interviewee’s age, nationality and art-related education. The background questions were followed by five more questions that dealt with the visual features of the work, the meanings and emotions associated with the work, the emotional experience of the participant and the familiarity of the work.
The duration of the interviews, during which the individual interviewees interpreted one of Munch’s works, was usually about five minutes, although some people talked much longer. All the interviews were digitally recorded.

All interviews were conducted in English. Because the language skills of the participants varied greatly, there were some challenges in the analysis of the interviews. It is also worth noting that the conditions in the exhibition rooms changed during the interviews. The amount of people and the level of background noise varied greatly.

**Results**

In the qualitative analysis, key attention was paid to the emotion concepts through which the participants described the emotional atmosphere of Munch’s works and their own emotional experience. In coding the interviews, the unit of analysis was either a single word or several words which seemed to form a coherent expression, like the feeling of “bad thoughts”. Sometimes it was necessary to interpret and shorten the expressions of the audience. For example the phrase, “I do not think it is a happy portrait” was categorized as a notion of “unhappiness”. Besides studying which concepts the participants used in the context of certain artworks, their ways of using these terms were also analyzed.

Following emotions and concepts were mentioned when it was asked what kind of emotions the interviewees associate with Munch’s two versions of *Madonna*:

**Painting:** anxiety, “bad thoughts”, death, erotic, happiness, “internal emotions”, joy, melancholy, pain, religiousness, sadness

**Lithograph:** anguish, calm, darkness, death, depression, dreamlike, ecstasy, erotic, lost, pain, peaceful, religiousness, sadness, serenity, sleepy, soothing, unhappiness, worry

As can be observed, the interviewees used emotion terms that are frequently used in everyday speech, not the concepts of aesthetics, like pleasure, while describing the emotional atmosphere of Munch’s works. When the emotion profiles of the two versions of *Madonna* were compared with the emotion profiles of other works of Munch (*The Scream, Angst, Separation* and *Eye in Eye*), *Madonna* seemed to contain more positive emotions. For example, terms like calm, dreamlike, ecstasy, erotic, happiness, joy, peaceful, religiousness, serenity, sleepy and soothing were mentioned in the context of *Madonna*, terms which were not linked to other works of Munch. However, it is worth noticing that just like in *The Scream* and *Angst*, there are threads of anxiety, pain and sadness also in the emotion profile of *Madonna*.

The terms death, erotic, pain, religiousness and sadness were mentioned in the context of both versions of *Madonna*. The painted version of *Madonna* gathered some very positive emotion terms like happiness and joy, while the sexually loaded term ecstasy and certain less intensive positive terms like calm, dreamlike, peaceful, serenity, sleepy and soothing were linked to the lithograph. More terms were mentioned in the context of the lithograph than in the context of the painting. Besides the moderately positive emotion terms, negative emotions like anguish, darkness, depression, lost, unhappiness and worry were associated with the lithograph, while anxiety, “bad thoughts” and melancholy were mentioned in the context of the painting.

In general, it seemed that the interviewees felt uneasiness while interpreting the lithographic version of *Madonna*, because the picture reminded them of things they did not want to discuss, such as the possible death of the child or the mother, the separation of the figures, or the problematics of abortion. Usually the presence of the figure of embryo/fetus/child in the frame of the lithographic *Madonna* seemed to be the key reason for the associations concerning death. Another reason was the dark coloring of the lithograph, as can be observed in the following excerpts of the interviews:

> It is quite soothing and calm, but then you can see the image of the face of that little child... You feel, not worried, but kind a bit of anguished... (Woman, 29, Australia, *Madonna* Lithograph, 116.)

> I think that the child... Madonna is so sad... I think that she knows that the child would be bad... The child is very difficult. (Man, 35, Italy, *Madonna* Lithograph, 170.)

Some interviewees compared the emotional expressions of the painted and lithographic versions of *Madonna* as follows:

> The colors are different... The shape is the same but the colors, all the colors, are so much darker in this one [the lithograph]. I went over there [the painting]... I think he captured more life to it. (Man, 52, USA, *Madonna* Lithograph, 120.)

> I find this [lithographic version] darker than the other [painted version]... Ecstasy comes more out of it, here the depression comes out of it, because the colors, I think, are very dark. (Man, 44, the Netherlands, *Madonna* Lithograph, 16.)

When it comes to cultural differences, especially the people from Southern Europe sometimes felt it difficult to combine Munch’s version of *Madonna* with their own ideas of the Madonna:

> It is not disturbing, no, it is quiet for me. Because it is all inside, nothing appears on the face... (Woman, 46, France, *Madonna* Painting, 113.)
It is a little bit controversial to what actually Madonna is for me. [...] I can't really understand that his image of Madonna is quite different than my image of Madonna. So his Madonna is about death... It is not really emotional... It is not really bringing forth emotions in me. (Woman, 46, Romania, Madonna Painting, I11.)

“The name is strange for me. It does not look like a Madonna. [...] Looks like eroticism... and anxiety, or some fear... it would have something to do with fear and emptiness... It is the connection between eroticism and death.” (Man, 47, Spain, Madonna Painting, I15.)

In Southern Europe, especially in Southern Spain, there is a strong tradition, starting from the Baroque, to represent Madonna and other female saints in the state of religious ecstasy. Even nowadays, especially in the popular piety of Andalusia, certain kind of eroticism is linked to the statues of Madonna (e.g., Hall, 2004). However, in the context of Munch’s work, the religious figure of Madonna has been set into secular context, and that is probably the key reason why the work is still experienced as confusing. While the interviewees from Southern Europe seemed to evaluate the work of Munch from the perspective of a religious tradition, people from Central and Northern Europe tended to interpret Munch’s Madonna either through its contemporary context or through the eternal theme of femininity and the different stages of it, as can be seen in the following citations:

A lot of depression, very dark kind of imagery. But it is about life, I guess, and it is also something about the time, the era, in the way people were quite restricted in the whole way of doing things. (Man, 44, the Netherlands, Madonna Lithograph, I6.)

I think it is first and foremost like a fertility... This is like the ultimate woman. [...] She is sort of happy that she has been able to give life to someone, but on the other hand she is also sad because she knows that by now it is done... she cannot give birth any more... She and her children will eventually pass away... (Woman, 25, Norway, Madonna Painting, I21.)

Certain cultural differences could also be seen in the ways in which the representatives of different cultures talked about emotions. For European and American people it seemed to be more typical to separate the emotional expression of the artwork from their own emotional experiences. Some Asian interviewees told that Madonna, as well as some other works of Munch, scare them.

[I feel] a bit scary… She is almost… she is quite beautiful but behind her are darkness, and very tiny, teeny child… a baby. So, combining life and death, maybe. (Woman, 67, Japan, Madonna Lithograph, I66.)

I feel scary… Maybe the girl is not happy, so I think she is sad... So because… I feel scary. (Man, 27, Japan, Madonna Lithograph, I64.)

One reason for this phenomenon may have to do with the learned discourses of art. In Western art criticism, it is typical to draw a distinction between the emotions expressed in artworks and those experienced by the audience. In other words, dark images of sad people are not necessarily classified as frightening, but they can be admired, for example, as an effective representation of some negative emotion, although the emotional state of sadness is not necessarily shared by the individual beholders. Besides the learned discourses of art, another reason for difference in emotional experiences between Western and Eastern interviewees can be the simple point that for Western audience, the anxiety-laden expression of Munch is more familiar than for the Eastern audience. That is why it is easier for the Western audience to cognitively evaluate expression instead of just feeling confused while facing Munch’s works.

However, sometimes it was difficult also for the Western audience to describe their own emotional reactions while observing the works of Munch. Although there were individual interviewees who told that the Madonna of Munch left them cold, most participants stated that their emotional experience is strong and usually somehow negatively loaded. There were also individual interviewees who reported having felt empathy, sympathy or sadness for the Madonna depicted by Munch.

**Discussion**

It is evident that pictures like the Madonna of Munch can elicit contradictory emotions in the audience – evoking experiences varying from indifference to devotion and sexual arousal. Differences in the emotional experiences of the interviewees can be explained through the appraisal theory of emotions which emphasizes the interaction between emotions and interpretation. Just the possibility of interpretation gives room for variations in emotional experiences.

Variation in emotional experiences can be either cultural or individual. For example, people from Southern and Northern Europe, or from America and Asia, have lived amid different kind of religious traditions and thereby have differing expectations concerning religious visual images and objects. In other words, because people have different kind of mental representations of Madonna, they appraise Munch’s image of Madonna differently and experience various emotions while observing it.
Although people from a certain culture are surrounded by a particular type of visual imagery, individual persons naturally have various opinions concerning their visual culture. For example, despite the fact that there are numerous images of Madonna in Andalusian homes, churches and public spaces, not all Andalusian people feel devotion in front of these images. Besides cultural issues, individual ideas, values and tastes also influence the emotional experience of certain artworks. Therefore, the appraisal theory enables explaining both the cultural and individual differences in art experiences.

Furthermore, appraisal theories can explain why a certain person can experience a certain work of art differently at different times. Not only the current moods of spectators, but also the contexts where the artworks are faced can modify the interpretations and emotions associated with the works. For example, it would be different emotionally to face the Madonna of Munch in a Norwegian or an Andalusian church than it is to encounter it in the exhibition hall where it shares the space with other works of either Munch or other artists.

Although the appraisal theories assume that cognition and emotion are essentially linked with each other, the order of cognition and emotion may vary. Sometimes cognition can precede emotion, and other times the situation can be reversed. (E.g., Roseman & Smith, 2001.) This flexibility in appraisal theory is extremely important in the context of visual art because it can be assumed that certain aspects of artworks are more prone than others to directly elicit emotions.

Paintings, for instance, contain visual elements like colors, forms and figures. While certain elements, like the colors and facial expressions of human figures, can directly influence the emotions of audience, there are other visual elements which function more indirectly. For example, the visual characteristics and meanings of allegorical figures are established through tradition, and the ability to recognize the tradition and evaluate a certain allegorical figure in its contemporary context can essentially influence the emotional experience. In this case, the process of interpretation essentially modifies emotional experience. However, it is necessary to remember that the line between nature and convention is not unambiguous. Visual elements like red color may immediately arouse us, but such elements may simultaneously carry many cultural and historical meanings. Furthermore, although allegorical figures in paintings were not recognized, it is still possible that, for example, the facial expression and gestural language of these figures arouses direct emotional reactions in the beholders. (Cf. Gombrich, 1952/1985; Gombrich, 1962/1985; Kuuva 2010b.)

Although it would be easy to state that abstract, expressive works of art elicit emotions in their beholders more directly than, for example, allegorical paintings, there are great differences between individual works of art belonging to either genre as well as between individual beholders. As stated by Friedberg (1989), Matravers (1998) and Carroll (2001) among others, it would be important to combine the study of aesthetic and emotional concepts with a detailed study of visual material.

For example, despite the fact that there are clear connections between the painted and lithographic version of Munch’s Madonna, there are also many important differences. The painting was usually more positively experienced than the lithograph. The key reason for this is probably the dark coloring of the lithograph which directly influences the beholders even before they get to study the details of the picture. However, the figure of the embryo/fetus/child, in the frame of the lithograph, functions differently than the dark coloring. The meaning of it must be related to other visual elements of the work before it is possible to evaluate the emotional significance of the wholeness and the relation of the work to other cultural representations of Madonna.

It is worth noting that in the interviews conducted at the Munch Museum, there were great differences in the willingness of the beholders to participate in an interpretive play with the artworks. While some interviewees told that they just want to pass certain works of Munch because they experienced the works as too oppressive, other beholders started to play with the meanings of works. A precondition for interpretive play seemed to be the ability and willingness to take reflective distance from the situation depicted in the artwork. Many people reflected their own experiences with the works of Munch. In appraisal theories it is assumed that not only the present but also the remembered or imagined situations can be appraised. Therefore, in many cases the works of art can work as mirrors through which to reflect personal experiences or life in general.

To conclude, the results of the interviews reported in this paper indicate how complicated the relationship between the work of art and the experiencing audience actually is. The beholders not only perceive the work of art, but they simultaneously apperceive the situation depicted in the work by evaluating the personal meaning of the work. In this process of apperception, both the earlier personal experiences of the beholders and their cultural background interact with the visual information of the artwork. (Cf. Kuuva, 2007.) That is why pictures like the Madonna of Munch can elicit contradictory emotions in the art audience – experiences that vary from indifference to devotion and sexual arousal.

Research in future: In future, the quality of pleasure and displeasure experienced in the context of art and other visual phenomena should be further investigated. Instead of studying how people rate certain studying how people rate certain predetermined set of visual examples, it would be also important to ask which kind of pictures and other visual phenomena create experiences of pleasure or displeasure in
people from different cultures and demographic groups. In the study of visual pleasure and displeasure, theoretical perspectives and methodologies of visual culture study, cognitive science, psychology and neuroscience should be combined. Besides surveys and interviews, the emotions of the audience could also be studied through brain imaging technology and supplementary psycho-physiological indicators.

Acknowledgments
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References
Dr. Bob’s SoundSchool: Using Music and Creativity to Enhance Science Learning for Grade School Children

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Abstract
This validation study was conducted to evaluate the effectiveness of Dr. Bob’s SoundSchool (DBSS), a second grade science curriculum designed to engage students through creative and inquiry-based lessons that teach the physics of sound with musical instruments and interactive exploration. Pre-tests and post-tests were compared between students learning with DBSS and the standard curriculum for the school district. Students who learned with DBSS showed greater gains in their divergent thinking skills, suggesting that DBSS supports deeper understanding and stronger ability to apply learning to new problems.

Keywords: Elementary Education, Creativity, Inquiry-based Science.

Dr. Bob’s SoundSchool
Dr. Bob’s SoundSchool (DBSS) is the hallmark educational project of the Bob Moog Foundation, a non-profit dedicated to inspiring science education through music and creativity. Bob Moog was an inventor best known for his work on electronic musical instruments including the early synthesizers used in popular music.

DBSS is an innovative 10-week curriculum that teaches second grade students the physics of sound using acoustic and electronic musical instruments such as the theremin, as well as oscilloscopes. Through DBSS, students learn about vibrations, waveforms, parameters of sound such as pitch/frequency and loudness/amplitude, and the physical difference between music and noise. Students also learn how to become scientific observers using examples from Bob Moog own science notebooks, all while participating in a STEAM- (Science, Technology, Engineering, Art and Math) based education.

The Curriculum
DBSS is organized around three research-validated tenets of elementary school science education: teacher training, creativity-based interaction, and inquiry-based examination.

Teacher Training
The curriculum is implemented at the school district level, which allows the Bob Moog Foundation to provide substantial instruction to the teachers who will deliver the lessons. This is an approach that has been shown to create an effective bridge from science and synthesis experts to the classroom. Particularly in elementary schools, it is unusual for teachers to have a strong interest in science, and often express anxiety or disinterest in teaching science (e.g., Steele, et al. 2013). Accuracy in delivering science lessons is more strongly associated with teachers using a prepared curriculum that includes materials for active exploration and with professional development (Nowicki, et al., 2013). In the same study, accuracy was not associated with pre-service preparation or proficiency (i.e., number of science courses or grades in those courses).

Loucks-Horsley et al. (2003) argue that professional development for teaching science must go beyond opportunities that provide general information in lecture or workshop formats. Instead, teachers must be given the opportunity to practice science and incorporate the teaching methods through application. DBSS follows this mandate, providing teachers with training from synthesis and science experts. Furthermore, as recommended by Willcuts (2009), teachers are given the opportunity to learn more than the information directly included in the DBSS curriculum so that they can facilitate student exploration. Teachers are also encouraged to explore the science of sound following the same inquiry-based approach used for the students. Teachers interact with the science of sound with expert support so that they are better able to share a love of sound science with their students.

Creativity-Based Interaction
Creativity in education is often only emphasized in art and music classes, and is treated as an approach separate from and inappropriate for more “serious” learning (Claxton, 2006). However, when students are given the opportunity to interact with science materials creatively, their gains in learning are significantly higher (e.g., Hendrix, Eick, & Shannon, 2012).

DBSS is comprised of ten main lessons for students that were designed to meet state and national standards for science education in the second grade. The lessons were structured around creativity theory (see Claxton, Edwards, & Scale- Constantinou, 2006). Students are given many opportunities to experiment, play, imagine, and express their curiosity. They are reminded that they are following the model of Bob Moog, the namesake of the curriculum, and that he always approached his invention with the spirit of playful experimentation, knowing that all of his ideas were worth writing down, even if he didn’t have a direct use for them at the time.
Inquiry-based Examination

The National Science Teacher Association (NSTA) has emphasized an inquiry-based approach to science education for over 10 years (see NSTA Position Statement: Scientific Inquiry, 2004), following the models set by the American Association for the Advancement of Science and the National Research Council. NSTA states that inquiry-based science education “reflects how scientists come to understand the natural world, and it is at the heart of how students learn. From a very early age, children interact with their environment, ask questions, and seek ways to answer those questions. Understanding science content is significantly enhanced when ideas are anchored to inquiry experiences.”

DBSS structures all student lessons around the use of science notebooks for recording observations in preparation for group discussions. Students are given a prompt at the beginning of each lesson, and then are sent off to explore materials and activities in small groups. Their task is to take notes about their reflections on the prompt for the lesson, which they do through making a combination of written reflections, charts, graphs, and pictures. This approach makes students the owners of their inquiry, which enhances test performance (i.e., summative evaluation), strengthens the teacher’s ability to know what students really understand (i.e., formative evaluation), and models the work of real scientists (Nesbitt, Hargrove, Harrelson, & Maxey, 2004).

Since DBSS uses a combination of recording in science notebooks and discussing results, students also benefit from the social modeling that occurs through open dialog (e.g., Baker, et al., 2009). Students describe and debate their observations all while using the scientific vocabulary of the lessons, which further reinforces a deeper understanding of scientific concepts (e.g., Parks, 2011).

Method

In the first year of implementation, we trained eight second grade teachers in the Asheville City Schools (Asheville, NC) through four sessions in the fall. The DBSS curriculum was taught to students in the spring semester in ten weekly sessions between January-March. At the same time, three other classes used the standard curriculum.

This research project was designed to provide proof-of-concept for the curriculum, and to explore any differences in learning between DBSS and that standard curriculum (SC).

Participants

There were 153 participants in this project. Of the four participating schools, two were identified as lower income based on the percentage of eligibility for free lunch. For the DBSS group, there were four schools, eight classrooms, and 114 students (67 from the two lower income schools and 47 from the two higher income schools). For the SC group, there were two schools, three classrooms, and 39 students (17 from the two lower income schools and 22 from the two higher income schools).

Materials

We created pre- and post-tests to evaluate student learning with the DBSS curriculum versus the SC. The tests comprised questions that addressed the learning objectives in the North Carolina Extended Essential Standards, which also meet national standards for science learning. The questions were designed to assess convergent and divergent thinking skills. Convergent thinking is the ability to identify the one correct solution. For example, students were asked to identify the parts of an ear from a diagram. Divergent thinking is the ability to express knowledge through examples. For example, students were asked to write a story about being the sound of a roar coming from a tiger.

The pre- and post-tests were equivalent forms with five total questions. Divergent questions asked students to imagine a sound scenario and then draw a picture or write a story. Convergent questions asked students to consider information and identify a correct solution, such as how a student might produce a louder sound from a xylophone with a mallet.

Procedure

Teachers were given permission forms for parents one month before the lessons were scheduled to begin. All parents (DBSS & SC) received the same permission form. The form had a section at the bottom for parents to cut off and return to the classroom teacher. The science coach for the school district distributed and collected the permission forms from the classroom teachers.

Teachers were given the pre-tests one week before the curriculum started through the science coach for the school district. The tests were distributed to each classroom teacher fully printed and prepared for distribution. Teachers were given instructions to allow students to attempt the assessment and “do their best” even if they had not yet learned the material. Teachers were assured that the assessments would NOT be used for any summative evaluation of them or their students. Once the pre-tests were completed, the science coach collected and organized the tests.

Teachers were given the post-tests one week after the curriculum ended through the science coach for the school district. The tests were distributed to each classroom teacher fully printed and prepared for distribution. Teachers were given instructions to allow students to attempt the assessment and “do their best” without additional aid from the teachers. Teachers were assured that the assessments would NOT be used for any summative evaluation of them or their students. Once the post-tests were completed, the science coach collected and organized the tests.

Tests from students with parental permission were then numbered for blind scoring. Two researchers were trained to score the test items using a provided rubric. An initial sample was evaluated for interrater reliability. Kappa values ranged from .89-.96, p < .0001. Once of these researchers was then assigned to score the rest of the pre- and post-tests.
Results

Repeated measures ANOVA was used to evaluate pre-/post-test score differences using group (DBSS & SC) as a between subjects factor. Separate analyses were conducted for Convergent and Divergent scores (see Materials).

In the Repeated Measures ANOVA for Convergent test scores, there was a significant main effect for time (pre- vs. post-), $F(1, 118) = 107.94, p < .0001$, and for group (DBSS vs. SC), $F(1, 118) = 4.98, p = .03$, see Table 1. There was not a significant interaction between time and group, $F(1, 118) = 1.30, p = .257$.

Table 1: Convergent Test Scores.

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre-test</th>
<th>Post-test</th>
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<tbody>
<tr>
<td>DBSS</td>
<td>6.28</td>
<td>8.69</td>
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<tr>
<td></td>
<td>1.79</td>
<td>2.10</td>
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<tr>
<td>SC</td>
<td>5.32</td>
<td>8.32</td>
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<td></td>
<td>2.04</td>
<td>1.80</td>
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<td>6.01</td>
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<tr>
<td></td>
<td>1.90</td>
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Note. Standard deviations are italicized below mean values.

In the Repeated Measures ANOVA for Divergent test scores, there was a significant main effect for time (pre- vs. post-), $F(1, 118) = 155.59, p < .0001$, and for group (DBSS vs. SC), $F(1, 118) = 61.44, p < .0001$, see Table 2. There was a significant interaction between time and group, $F(1, 118) = 4.33, p = .04$.

Table 2: Divergent Test Scores.

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
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<td>5.23</td>
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<tr>
<td></td>
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<tr>
<td>SC</td>
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<td></td>
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<tr>
<td></td>
<td>1.16</td>
<td>1.12</td>
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</tbody>
</table>

Note. Standard deviations are italicized below mean values.

Additional Repeated Measures ANOVA analyses were conducted including SES (low vs. high) as a second between subjects factor along with group (DBSS vs. SC). For both Convergent ($F(1, 116) = 5.94, p = .02$) and Divergent ($F(1, 116) = 4.04, p = .05$) test questions, the interactions including SES were also significant (see Figures 1 & 2).

Figure 1. Convergent test scores for the interaction of time (pre-test vs. post-test), group (SC vs. DBSS), and SES (lower vs. higher).
Discussion

Overall, students using the DBSS curriculum showed more knowledge gained on the post-test. On the Convergent test scores, there was no difference between the two curricula. On the Divergent test scores, where students had to express knowledge through stories and drawings, the DBSS students had significantly higher scores.

These results suggest that both curricula increase knowledge about the science of sound. However, the interactivity of creative and musical engagement with the DBSS curriculum better supports making active and interactive use of that knowledge. Students who learned through Dr. Bob’s Sound School were prepared to apply their knowledge to novel situations.

Interestingly these results may be moderated by socioeconomic status, particularly for lower SES students. When SES was added as a factor in analyses of pre-test vs. post-test scores, students in the low SES & SC (standard curriculum) group improved beyond those in the DBSS (Dr. Bob’s SoundSchool) group on the Convergent test questions. For the Divergent test questions, students in the low SES & DBSS group improved beyond those in the SC group. This suggests a potentially differential influence on type of learning (Convergent vs. Divergent) based on the curriculum style.

This research was exploratory in nature and used convenience sampling to recruit participants. Future research of DBSS and the implications of a creative and inquiry-based science curriculum should employ a wider sample with more varieties of curricula compared. Furthermore, given the interesting variations based on SES, more research should be conducted to explore differences in familiarity and preparation for science and curricular outcomes.

Acknowledgments

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How Context Works!
Different Ways to Study the Effects of Context on Aesthetic Experience

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Abstract
Context is an important variable in aesthetic experiences. In this contribution the main lines of research that study the role of context in art appreciation in the museum - or the laboratory - are discussed.

Keywords: Art perception, museum, context.

Since the beginning of empirical aesthetics as a psychological science in the late 19th century, art has been one of its topic of research (see Fechner, 1879; Lipps, 1905; Wundt, 1919). The prototypical place in which art is found seems to be the museum. Today, visiting a museum, at least in many western cultures, for many people is a familiar though not very frequent experience. For example, according to the monthly published statistics of museum visits in the UK, the National Gallery in 2014–15 (until June 2014) had 575600 visitors in the last fiscal year, and the British Museum counted even 641259.

Regarding the psychological aspects of a museum visits, the model of aesthetic experience by Leder, Belke, Oeberst, and Augustin (2004) provides a theory of what people experience when they perceive art. This model considers context as a relevant determinant. Context is placed outside the perceiver of art, in the environment that assures a kind of pre-classification. “This pre-classification can be assured by a number of possible context features. The appearance of an object in an art exhibition, in a museum or art gallery is a strong contextual cue for classifying an object as one that warrants aesthetic processing. Some authors have argued that according to Kant’s notion, the perceiver needs to be in a certain state to have aesthetic experiences. Cupchik and Laszlo (1992), for example, called this an ‘aesthetic attitude’.” (Leder et al., pp. 493-494). Over the last decade several researchers systematically addressed the role of such a conception of context.

Three lines of research can be distinguished: Firstly, systematic variation of the classification of the presented “art” by experimenter, instructions or the presentation format. For example, Locher, Smith, and Smith, (2001) studied the comparability of viewers’ responses to slide-projected and computer-generated reproductions of paintings from individuals experiencing the original paintings in the museum. They found, that while evaluations of pictorial qualities were not much affected, the hedonic qualities differed remarkably depending on presentation format (and viewers status of expertise). Variations of assigning the artwork to different status was employed by Kirk, Skov, Hulme, Christensen, and Zeki, (2009), who presented stimuli as being art or computer-generated patterns. They found that the assignment systematically affected the aesthetic judgment regarding the artistic value, but they also found informative differences in brain activities. In a study, in which participants had been instructed to either take an aesthetic or a non-aesthetic stance, differences in experiencing the stimuli – evaluations and brain activities - provided interesting information about the nature of an aesthetic stance (Cupchik, Vartanian, Crawley, & Mikulis, 2009). Similarly, by embedding abstract art or street art into their usual context (street scenes or museums), we systematically studied the appropriateness of context, the style of the artwork (modern art, versus street art), plus individual variation in interest and taste for art or street art (Gartus & Leder, 2014, in press). The artworks and graffiti art were shown in either street or and museum scenes and were evaluated on liking, interest, and valence by participants with different style preferences. We found that interest in graffiti art had a positive effect by increased ratings on all scales for graffiti art, but not for modern art. On the other hand, being interested in modern art had a strong influence on the liking and interest ratings for modern art, but not for graffiti art. Concerning valence context effects, interest in graffiti art had a stronger positive influence on the valence ratings in a street context (“grey cube”) than in a museum context (“white cube”). This study shows how object, context, and perceiver characteristics together create differences in aesthetic experiences.

Secondly, effects of context have also been tested directly in the context of the museum. This way, the specific effects of the aesthetic experience in the museum are measured in museum studies when museum visitors were systematically studied – in their explorative behavior (Smith & Smith., 2001). They found that people spent a median time of 17 seconds in front of artworks. This is much longer than the time usually employed in any laboratory study. In a very elaborate project by Tröndle and Tschacher (2012), museum behavior was studied by employing a large variety of measures such as locomotion of visitors, times of perceiving specific artworks, or various physiological responses. This way, the museum replaces the laboratory, and reveals some surprising insights into aesthetic experiences.

As an additional third step, the direct comparison between museum and laboratory experiences can be studied when the museum visit is translated into a laboratory setting. The comparison of media effects by Locher, Smith, and Smith (2001) is a good example. In a recent study, Brieber, Nadal, Leder, and Rosenberg (2014) employed a balanced design of
museum visit, and perceiving the exhibition in the laboratory – as a computer version. This study also revealed, what is different between art in the museum and in the laboratory: the intensity and the duration of the aesthetic experience.

Together these different approaches reveal, that psychological art research has reached a state in which hypotheses driven, experimental approaches will further clarify the role of context. Despite the high association with art in museums or galleries, empirical study in aesthetic and psychology of the art, still was mostly done in the laboratory. Laboratory experiments have their merits, they offer control of experimental and control variables, and limit the effects of unwanted confounding variables. On the other hand, the study of art in the laboratory, when art is presented as small reproductions on computer screens limits the generalizability to the real experience. Thus, while some features such as media format have been studied in the past, a comprehensive study of the role context opens a fascinating perspective on the psychology in the arts.

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Do Cognitive Modules Determine Beauty and Aesthetic Perception?  
Interdisciplinary Research on Cognitive Neuroaesthetics and Humanistic Aesthetics

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Abstract

Cognitive Modules Hypothesis suggest that everything is the unity of inherent value and appearances. Things that arouse positive emotional responses is beneficial for man. Through this process as a medium, the appearances of them can arouse positive emotional responses. In this way, those things create Cognitive Modules associated with positive emotional responses in the cognitive structure in human brains. Under the precondition of the established Cognitive Modules, when man sees the appearances of things matching the Cognitive Modules, the aesthetic perception will be generated spontaneously. The reason why things can arouse aesthetic perception is that they match the Cognitive Modules.

Keywords: the essence of beauty; aesthetic perception; Cognitive Modules; cognitive aesthetics

How can human aesthetic actions be approached? We shall see that aesthetic actions definitely take place in real life. The world man lives is both natural and social. This makes aesthetic actions have humanistic and social causes, as well as characteristics of neural activities. We should bring about the integration of humanistic social science method and cognitive neural science method, and we design neural scientific experiments in the light of aesthetic phenomenal behavior.

1. The Foundamental Issues and Orientations of Aesthetic Research

Every effective research has correct problem directions, rational orientations and methods. The basic target of aesthetics is to reveal the mechanism of human aesthetic actions, while the basic question to be answered is --- why are things beautiful? According to Plato, beautiful things are beautiful, since they have the essence of beauty. Therefore, beauty should be found in beautiful things, and the question “What is beauty?” should be raised. However, researches on this field has not been quite successful.

Dr. Chatterjee suggests that we can not find beauty in places outside our brains. Our mind is part of the world, while our mind, experience and behavior have been shaped by the external world during the long evolution period. Our brains have evolved to find some universally beautiful things. This statement that represents some current neuroesthetic study on the ideas of some aesthetic fundamental issues, is quite rational. Material objects can not exist in human minds, as “mountain” and “trees and grasses” can not exist in the brain. Meanwhile, we can not say that “beauty” exists in human brains. The only things that exist in the brain are the conceptions about various things, which are some signs labelled by language. As a matter of fact, when people mention “beauty”, they do not refer to actual signified things. What exists in human brain is only the word “beauty”, and the concept of beauty, but not “beauty”. This word of “beauty”, often refers to beautiful things. For example, what we often say about beauty refers to beautiful sceneries and beautiful people, etc.

Therefore, things that become human aesthetic objects is not “beauty” itself, but beautiful things. Various beautiful things are different in forms and natures, without common properties of objective aspects. Beautiful things have merely functional common points --- they all can arouse aesthetic perception. Hence the rational issues and correct orientation should be: how can one generates aesthetic perception? Why can one regard some common things as beautiful things? Or rather, by what process, “can our brains evolve to find some universally believed beautiful things?”

2. Revelation of Aesthetic Mystery --- Cognitive Modules Hypothesis

Not all things can arouse aesthetic perception. Things which can arouse aesthetic perception must have some properties. What property makes an object an aesthetic objective? Dr. Chatterjee’s analysis on a number of aesthetic actions shows a universal phenomenon, that is, beautiful things are generally beneficial for humans. Regardless of human face, human body or beautiful natural things, they are related to

human actual needs --- either good for human reproduction, heredity, or good for human survival and health. We gain inspiration from this: what is the connection between the benefit of things and human emotion?

It is obvious that there is connection between the interests of things and human emotion. Things that are beneficial for man cause positive emotions, while things that are bad for man cause negative emotions. Positive emotion is not really aesthetic perception, but one can only have aesthetic perception on the basis of positive emotion. Things that cause negative emotions cannot be beautiful things. Therefore, aesthetic perception should have some connection with positive emotion, while aesthetic perception is different from positive emotion.

In life, when one is short of the basic needs of survival, for example, if one is thirsty or hungry, his body is not in a good balance, which forms unpleasant feelings and survival requirement. After the survival requirement is fulfilled and the body is in a good balance, one can experience and feel the balanced state called positive emotion. When we appreciate beauty, my body is basically in balance and there is no urgent survival requirement. At this time, through the cognition of things’ appeances by visual sense and auditory sense, one can also gain sense of pleasure. That is, the positive emotion generating from the fulfillment of survival need is pleasure or positive emotion, while the positive emotion generating from the recognition of things’ appeances is aesthetic perception. In other words, pleasure and aesthetic perception are both aroused by things that are beneficial for humans. The difference between aesthetic perception and pleasure lies in: pleasure is caused by the internal beneficial value of beneficial things, while aesthetic perception is caused by the appeances of beneficial things.

What to be emphasized here is that, the things’ appeances that arouse aesthetic perception must be the appearances of beneficial things. If the similar appearances are shown on something harmful, they can not be appreciated as beauty. For example, the appeances of bees and wasps are similar, and sometimes the color of wasps are even brighter. However, the bees are beneficial, therefore they are beautiful; wasps are harmful for people, therefore they are not beautiful.

As a result, the problem is concentrated here: how can the appearances of beneficial things arouse the aesthetic perception? Despite the fact that there is no objective “beauty”, we should find the reason from human cognition. For this purpose, we propose “Cognitive Modules Hypothesis” --- to explain the inner mechanism of aesthetic actions with the characteristics and functions of the human brain’s information processing.

Human actions and activities are conducted through the cognitive process. Once one encounters something --- eats a banana, for instance --- the perception of bananas’ appeance and feelings of the inherent value will form process and memory inside the brain. There is corresponding relationship between the external stimulus and the internal response inside the brain. However the appeance of an object, is the correspondent part within the cognitive structure will respond in the same way. Therefore, the unique appeance of every object has an unique way of response in the cognitive structure. There are particular patterns of neural connection in the cognitive structure, which we called “perceptual pattern”.

After the perceptual pattern is formed, it becomes the foundation of the framework of human brain cognition. Afterwards, when we encounter objects or their appeances similar to perceptual pattern, the established structure of neural connection will show the phenomenon of “facilitation” when processing the information, forming what we call “intuition”. This is conducive to swift recognition and response to outside world.

Every object is a unity of inherent value and external appearance. Generally speaking, the appearance of things can not fulfill the survival need, while the essence of objects’ interestness is of great value and importance to human survival. As long as the information is associate with human survival, it can cause the subjective emotional response. The cognitive appraisal of meaning or significance is the foundation, as well as the essential features of all emotional state. This emergence of advanced cognitive activity together with its connection to the emotional state, makes all the emotional experience under the premise of phisical state and cognitive state, --- what kind perception will form what kind of emotion.

While the external appearance of things themselves do not have the function of arousing emotional responses, the essence and appearance of things are indispensable, thus the appearance become the characteristics and symbols of the objects and their inherent value. This symbol and characteristics can trigger some responses about interests like things themselves and their essence in human cognitive processing. For example, the training that the laboratory mice associate sound with electrical shock, make the laboratory mice establish an frightening emotional memory to particular sound. It is the electric shock that cause damage to the the laboratory mice, but not the sound as the form perception. However, when the feeling of detrimental electrical shock is close to the sense of sound on the time, the laboratory mice would associate the two incidences, forming the particular Cognitive Modules. They establish a sense of fear responding to the particular sound before or after the electrical shock.

In this case, human beings are similar. The reason why man pays attention to the appearances of object is to seize the

inherent value of interests. Under the intermediary function of objects’ interests, there are stable relationship between the external appearance of things and human emotional responses. This circumstance enable human emotional attitude to associate comprehensively with objects, as if it is attached to things as a whole --- both attached to the internal functions, and attached to the appearances. Not only the essence of things can arouse emotion due to the direct interests, the appearances of things without interests can also arouse emotion indirectly through perception, namely, form cognition. The connection between the essence and appearances of things is stable, so is the connection between the substantial function and emotional response. As a result, there is a stable connection between the appearances of things and emotion as well. For example, in people’s life, there are relatively stable connections between many things’ appearances and human perception as well as emotion. The appearances of flowers, grasses, cattle and sheep associate with positive emotions, while the appearances of skeletons and shit universally associate with disgusting feeling. In this kind of relationships, the appearances of things first act on human perception, forming corresponding stable perceptual pattern. Then, things’ interests together with perceptual pattern act on emotion, forming particular emotional responses. In this way, the chain of “appearances --- perception (perceptual pattern) --- emotional responses” is formed, taking the perceptual pattern as the medium. If the human mental activity is taken as a whole, the stable connection between the perceptual pattern and perceptual pattern constitute a cognitive module, forming such a relationship between subjects and objects as things’ appearances-subjective cognitive module (perceptual pattern + emotional responses).

All the things beneficial to man can generally depict perceptual patterns associated with positive emotions in human brain. Under the premise of the existing Cognitive Modules, man generates positive emotion spontaneously as soon as he sees the appearances of things matching the Cognitive Modules. If at this time human body is in a balanced state of utilitarian need, the positive emotion of this time will be experienced as aesthetic perception. For example, facing a hand of fresh grapes, however, when man is in a state of utilitarian need, both hungry and thirsty, the first thing to consider is to eat these grapes; when man is in a state of non-utilitarian need, man appreciates the appearances of the grapes, forming aesthetic perception. In case of forming aesthetic perception, man will call things which arouse Aesthetic Perception “beautiful things”, and then call them “beauty”.

It is thus clear that the premise of aesthetic action is that the appearances of things has already shape Cognitive Modules associated with positive emotions, on the basis of things’ advantages. Taking the inner structure of the established Cognitive Modules, man can form aesthetic perception to the corresponding appearances of things instinctively. This is the process in which the brain “is shaped by outside world”, as is the mystery of Aesthetics.

3. The generalized Cognitive Modules are greater than the specific Cognitive Modules.

The formation mechanism of Cognitive Modules shows that only the things beneficial to man can shape Cognitive Modules which is associated with positive emotion in human brain. In Aesthetic Perception this principle shows that only things beneficial to man are considered as beautiful, while things harmful for man are not beautiful. The inherent advantages of things determine that the appearances of things can have aesthetic properties, and whether the forms of things are beautiful or not depends on their own advantages.

However, in real life there are some objects which are beneficial for man but not beautiful, or some objects which are harmful for man but beautiful. For example, manure used in farming is beneficial for man, but it is usually considered not beautiful. On the contrary, poppies are raw materials of drugs, which is harmful for man, so they should not be beautiful. However, people who are not addicted to drugs, who are against drug abuse, and who knows poppies are raw materials of drugs, appreciate poppies as well. In this way, is it tenable that benefit is considered to be the basis of the formation of Cognitive Modules?

Cognitive Modules theory suggests: now that the formation of Cognitive Modules is the reflection of things’ appearances, the existential forms of things can have some effects on the formation of Cognitive Modules. Things have many different classifications of existential forms, --- some things exist in forms of kinds, and there are differences in the same kind but they have similar existing expression. There are various trees in tree species, and there are various birds in bird species. When many things beneficial for man form a group due to similar characteristics, the corresponding Cognitive Modules can also form a group, which is called “Cognitive Module group”. For example, common plants are beneficial for man, which feature flowers as the outstanding and remarkable external form. Under the intermediary function of plantal advantages, the flowers are favorable to man, and make Cognitive Modules associated with positive emotions in human perceptual structure. That is, many plants together constitute the group of flowers; the human perception of flower group is classified, forming a Cognitive Modules group about flowers.

Gravity exists in physical world. The law of gravity is that the mass of heavy things have gravity on light things. The law of cognition is that the function of Cognitive Modules group is greater than individual Cognitive Modules, as if the mass of Cognitive Modules group is heavier than individual Cognitive Module. Cognitive Modules thus can attract and cover individual Cognitive Modules. A poppy is one kind of all flowers. Poppies as specific things can be harmful for man, but the harm is theoretical and conceptual for most people, who do not experience the toxicity of poppies. Conceptual knowledge is not so vivid, fresh and intense as the knowledge from personal experiences, and has limited influence on emotional experiences. In human
perceptual experiences, poppies’ harm is not so obvious and intense, while compared with the harmfulness, the consistency of their appearances with flowers is more obvious and remarkable instead. That is, on the condition that poppies’ harmfulness is not the concern, the appearance of flowers is generalized into the Cognitive Module Group beneficial form, therefore they can be appreciated and become beautiful. The manure for farming on its own terms is beneficial for man, but the feaces as a classified object, is dirty, harmful, and disgusting in the daily life, which can form negative Cognitive Module group. The Universality in daily life make people’s harmful feeling pretty intense, while the beneficial feeling of feaces is not so powerful. Therefore, the individual and originally beneficial manure is generalized into negative Cognitive Module group, which can not be appreciated.

The relationship between Cognitive Modules and the interests of things can be called vertical connection; the relationship between Cognitive Modules groups can be called horizontal connection from form to form. The vertical connection is more fundamental and determinant. Only when the vertical connection is not close and intense, can the appearance of things be classified horizontally to have the opposite interested value. Once the original interested value is remarkable and powerful, the vertical connection will show up, and the meaning of things’ appearances will be consistant with their own interested quality, instead of classifying into the Cognitive Modules opposite to the interested value. Suppose the drug made of poppies makes someone a broken family, and he visibly sensed the harm of poppies. The appearances of poppies establish a vertical connection with harmfulness. From his perspective, poppies can not be beautiful.

4. Cognitive Module is the automatic formation of neural implicit structure.

According to the law of neural activities, the establishment of Cognitive Modules, including the internalized process of perceptual structure when perceiving the appearances of things, the comprehension of things’ value and its connection with emotion, is accomplished automatically by brain neural activities, unnoticed by human consciousness. Therefore in real life, people are not aware how their own cognitive module form. For example, the research on Arachnophobia discovers that most Arachnophobia comes from young childhood experiences. Adult patients of Arachnophobia feel scared when seeing spiders, but when asking what they scare, they can say nothing. From the perspective of aesthetic perception theory, this happens because one associates the perception of spiders’ appearances with the feeling of fear, establishing stable Cognitive Modules. Later when he sees the spiders, automatic emotional responses will be formed while the childhood memory has already lost. Therefore, all the human Cognitive Modules should have their own formation process and specific reasons, but not all people can realize them. People sometimes can find the reason why they like something, while in much more cases they can not find the reasons.

Since people know neither the formation process of their own Cognitive Modules, or notice the existence of Cognitive Modules, people usually only realize the current causal relationship between things and emotional responses, but they are aware of neither the appearances of things inside the brain and perceptual pattern, nor the connection between perceptual pattern and emotional responses. In the formation process of aesthetic perception, it seems that emerging objective things arouse human aesthetic perception. Actully, people discover some individual objects matching Cognitive Modules, or people recognize things according to existing Cognitive Modules, so as to activate the emotion. Aesthetic perception is not originated from “beauty”, but is aroused by appearances of things matching the established Cognitive Modules. The reason why the appearances of something can arouse aesthetic perception, is not that there is “the property of beauty” or “the nature of beauty”, but that it suits and matches the Cognitive Modules in the subject’s cognitive structure. The formation and specific forms of Cognitive Modules determine which thing is beautiful, and whether the aesthetic perception happens.

The hypothesis above needs to be more precisely experimentally testified in neuroaesthetic research.

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Asymmetries in Art: Putting Your Best Cheek Forward

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Abstract
When posing for a portrait, people tend to adopt a classic three-quarter view, offering more of one side of the face to the artist. Though you might expect a 50:50 split between left and right cheek poses, research shows that people favor the left cheek. Why? This paper explores the reasons underlying this posing asymmetry, arguing that the left cheek bias results from hemispheric asymmetries in emotional expression. Because the left side of the face is predominantly controlled by the right side of the brain (dominant for emotion processing), expressions are more pronounced on the left side of the face. Consequently, people intuitively offer the left cheek to express emotion and perceive models adopting left cheek poses as more emotive.

Keywords: perception; cheek; emotion; asymmetry; face; art

Passports, driver's licences, and other full-face photos are notoriously unflattering. Thus when offered the opportunity to pose for a portrait, we rarely face the camera straight-on. Instead, we adopt a classical three-quarter view, offering more of one side of the face to the camera, or the artist (e.g., the Mona Lisa; Figure 1). But which side of the face is your best side: the left, or the right? Statistically you might expect that preferences would be split 50:50, with half the population favoring their left cheek, and the other half, their right. However research indicates a distinct preference for the left cheek: across both painted and photographic portraits, models are more likely to put their left cheek forward and this bias is particularly pronounced in females (McManus & Humphrey, 1973; La Bar, 1973). This paper examines research investigating the left cheek bias, and explores the reasons underlying this posing asymmetry. Ruling out mechanical and perceptual biases, the paper argues that the left cheek bias results from hemispheric asymmetries in emotional expression. The left side of the face is predominantly controlled by the right side of the brain which is known to play a dominant role in emotion processing (Patten, 1996). Consequently, the left side of the face expresses stronger emotion than the right side; people intuitively offer the left cheek to express emotion (Nicholls, et al., 1999) and perceive models adopting left cheek poses as more emotional (Nicholls, et al., 2002). As females tend to be more emotionally expressive than males (Kring, et al., 1994), this can help explain why females are more likely to be depicted adopting left cheek poses than males. Moreover, as the left cheek appears more emotionally expressive, we unconsciously use cheek shown as a cue when presenting or determining academic specialisation and scientific standing: we judge people posing offering the right cheek as more scientific whereas those who adopt a left cheek pose are deemed more artistic (Lindell & Savill, 2010). As such, the research demonstrates that when posing for a portrait, something as subtle as a 15 degree head turn implicitly influences others’ perceptions: the cheek shown sends a silent social signal to the viewer (Lindell, 2013b).

Figure 1: Left Cheek bias in Leonardo Da Vinci’s Mona Lisa (1503-1506).

The left cheek bias in painted portraiture was first established by McManus and Humphrey (1973). They examined posing biases in 1474 painted portraits, dating from the renaissance to the present day, and found that 68% of female, and 56% of male, portraits offered the left cheek. Assuming that the two sides of the face are likely to be equally attractive, and equally likely to suffer from a minor disfigurement (e.g., birthmark, mole, spot), such a bias toward one side of the face appears initially puzzling,
prompting a number of suggestions to account for the posing preference.

Further evidence against a purely mechanical account of the left cheek bias for portraiture comes from inspection of self-portraits. Whereas portraits of others show a left cheek bias, self-portraits show a right cheek bias (Lindell, 2013a). Before cameras were available, self-portraits were painted using a mirror that reverses left and right (see Jonannes Gumpp’s 1646 self-portrait for illustration; Figure 3). Thus a right cheek self-portrait depicts the artist’s mirror-reversed left cheek. Lindell (2013a) demonstrated that the proportion of right cheek self-portraits has decreased since the invention of the camera made other posing possibilities more easily available (from 61.6% of portraits painted from 1452-1839 to 43.2% of portraits painted between 1840-2008). The reversed bias in self-portraits, and changes in the proportions of left and right cheek self-portraits over time, both argue strongly against the notion that cheek preference in portraiture reflects a purely mechanical bias.

The fact that the left cheek bias is influenced by gender similarly challenges a mechanical account. Recall that McManus and Humphrey (1973) found a stronger left cheek bias for females, with 68% of females, and 56% of males, offering the left cheek. If the bias were purely mechanical, gender would not influence the phenomenon. As such, a mechanical account of the left cheek bias can be ruled out.

**Mechanical Bias?**

The bias toward the left cheek could result from the mechanics of painted portraiture (McManus & Humphrey, 1973). For example, a right-handed artist would grasp the palette with their non-dominant left hand. This would facilitate the painting of models that appear to the artists’ left as they can be viewed over the palette (illustrated in Vermeer’s 1666-1673 *The Art of Painting*; Figure 2). In such an arrangement, the artist's left cheek faces the model, potentially encouraging the model to mirror the pose, creating balance (McManus & Humphrey, 1973). In addition, the arm musculature may make it easier for right-handed artists to paint left cheek profiles, using quick and precise abductive, rather than adductive, arm movements (Nicholls, et al., 1999). Though such arguments are initially appealing, if the left cheek bias was purely mechanical then it should be reversed in left-handed artists. Inspection of the artistic canon confirms that this is not the case. Many of the great masters were left-handed (e.g., da Vinci, Michelangelo, Rembrandt), and examination of the portraits painted by left-handed artists indicates that the left cheek bias is not influenced by artist handedness. As Nicholls, et al. (1999) report, both Raphael and Holbein were left-handed, and their portraits still show a strong left cheek bias: 70% and 57% respectively.

**Perceptual Bias?**

Perceptual preferences have been suggested as an alternate account of the left cheek bias. McManus and Humphrey
(1973) raised the possibility that viewers may find left cheek portraits more pleasing to the eye, leading to an aesthetic preference driving the left cheek bias. When a portrait is composed with the left cheek forward, the majority of the facial features appear in the viewer’s left visual field. As the left visual field projects to the right hemisphere which contains brain areas specialized for facial recognition (e.g., fusiform face area; Kanwisher, et al., 1997), left cheek poses may allow more efficient processing of facial features because they project those features directly to the hemisphere specialised for facial processing. However a perceptual bias based on viewer aesthetics cannot explain why the left cheek bias is stronger for portraits of females, nor why it is reversed in self-portraits. Thus neither a mechanical, nor a perceptual, bias can successfully explain the left cheek bias in portraiture.

**Emotion**

Nicholls, et al. (1999) put forward the novel suggestion that the left cheek bias stems from the sitter’s unconscious desire to express emotion. Although we are rarely conscious of it, we express stronger emotion on the left side of the face. Because the lower two-thirds of the face are innervated contralaterally (Patten, 1996), the left side of the face is predominantly controlled by the right hemisphere. In addition to housing regions specialized for face processing, the right side of the brain is dominant for the expression and perception of emotion (e.g., Demaree, et al., 2005). As a result, whether smiling or sneering, we show stronger emotion on the left side of our face. Consequently, chimeric faces composed of mirrored left cheeks are perceived as showing stronger emotion than right cheek chimeras (e.g., Sackeim, et al., 1978), and left cheek portraits are perceived as showing stronger emotion than right cheek portraits (e.g., Harris & Lindell, 2011).

To test their hypothesis, Nicholls, et al. (1999) asked participants to pose for a portrait in one of two conditions. Half the participants were instructed to imagine that they were about to travel overseas for 6 months, and were asked to pose for a portrait that showed their close-knit family how much they loved them (emotive condition). The other half of the participants were instructed to imagine that they were a scientist who had just been accepted as a member of the Royal Society; they were asked to pose for a photo that shows that they are intelligent but not smug, and to avoid depicting any emotion at all (impasse condition). As anticipated, Nicholls, et al. (1999) found that posing biases were influenced by the emotional context: participants were more likely to offer their left cheek for the emotive condition (58% females, 64% males) and their right cheek for the impassive condition (57% of both females and males). These data were interpreted as suggesting that people have an intuitive understanding that the left side of the face expresses stronger emotion.

The fact that people offer their left cheek to express emotion (Nicholls, et al., 1999) may help explain the gender difference in posing biases. Research indicates that females are more inclined and more willing to openly express emotion than males (e.g., Kring, et al., 1994), potentially leading to a stronger left cheek bias for females than males. In a similar vein, research confirms that people who rate themselves as more emotionally expressive are more likely to pose offering the left cheek (Nicholls, et al., 2002), consistent with the notion that differences in emotional expressivity underlie the left cheek bias.

The research reviewed so far suggests that models pose offering the left cheek to express emotion (e.g., Nicholls, et al., 1999, 2002). A number of studies have confirmed that this silent social signal communicated by the left cheek pose is received by the viewer (e.g., Harris & Lindell, 2011). For example, Nicholls, Wolfgang, et al. (2002) presented participants with left, midline, and right cheek poses of models and asked participants to rate each model’s emotional expressivity (Kring, et al., 1994). Participants were unaware that half of the images had been mirror reversed to determine whether perceptions of emotional expressivity were influenced by perceptual or aesthetic biases rather than the physiognomy of the expression. Irrespective of mirror reversal, left cheek and midline poses were rated as being more emotionally expressive than right cheek poses. Such findings confirm that not only do people offer the left cheek to express emotion, but that viewers perceive left cheek poses as expressing stronger emotion: something as seemingly subtle as a 15° turn of the head alters perceptions of emotional expressivity.

**Academic Specialisation**

Reasoning that stereotypic representations of different academic disciplines differ in perceived emotional expressivity (e.g., "cold, unfeeling scientist"; Nicholls et al., 1999, p.249), Lindell and Savill (2010) speculated that cheek shown may communicate more than just emotionality. They presented participants with pairs of left and right cheek images (half mirror reversed to control for perceptual biases) and asked them to make a forced-choice decision, indicating which image in each pair looked more like a chemistry student, a psychology student, or an English student. As predicted, identical models were deemed to look more like chemistry students when posing offering the right cheek, and more like English students when posing offering the left cheek, in line with popular stereotypes of serious scientists and creative writers.

Data from collections of painted portraits appear congruent with Lindell and Savill’s (2010) findings. Indeed, Nicholls, et al. (1999) found that the collection of portraits in the Royal Society, London, fails to show the left cheek bias that characterizes other portrait collections (e.g., National Portrait Gallery, London); as illustrated in Figure 4, scientists such as Albert Einstein adopt a right, rather than left, cheek pose. By reducing exposure of the ‘emotional’ left cheek, such a pose appears to enhance perceived scientific standing. For example, ten Cate (2002) presented participants with painted portraits of university professors, dated from 1710-1760;
participants were asked to rate how “scientific” each professor appeared. Professors depicted in right cheek portraits were rated more scientific than those presented in a left cheek pose, even when the paintings were mirror reversed. These data confirm that our implicit understanding that the left cheek is more expressive exerts a significant influence on our perceptions of academic specialisation.

The advent of the internet has presented a novel way to assess academics’ presentation of themselves via webpage portraits. Churches, et al. (2012) sought to determine whether stereotypical representations of different disciplines lead to differences in posing bias in different academic areas of specialization. They surveyed the university homepage photos of 5829 academics from disciplines in both the arts and the sciences. As expected, academics in the sciences (engineers, chemists, mathematicians) were more likely to pose offering the right cheek, whereas English and psychology academics were more likely to offer the left cheek. These data appear completely consistent with those reported by Lindell and Savill (2010) and ten Cate (2002): academics intuitively pose differently according to their area of specialization, and viewers perceive academics differently according to the pose adopted.

**Conclusion**

This paper has argued that the left cheek bias evident in painted and photographic portraits reflects hemispheric asymmetries in emotional expression. As the right side of the brain plays a dominant role in emotion processing and controls the left side of the face, the left side of the face is more emotionally expressive. The research reviewed demonstrates that people intuitively offer the left cheek to express emotion (Nicholls, et al., 1999) and perceive models adopting left cheek poses as more emotional (Nicholls, et al., 2002; Harris & Lindell, 2011). Moreover, because the left cheek appears more emotionally expressive, we unconsciously use cheek shown as a cue when presenting or determining academic specialisation and scientific standing (Lindell & Savill, 2010; ten Cate, 2002; Churches, et al., 2012); we judge people posing offering the right cheek as more scientific whereas those who adopt a left cheek pose are deemed more artistic. As such, the research demonstrates that when posing for a portrait, something as subtle as a 15 degree head turn implicitly influences others’ perceptions: if you want to be perceived as open and creative, rather than dry and scientific, it might be time to turn the other cheek.

**References**


Figure 4: Right Cheek bias in Max Liebermann’s *Portrait of Albert Einstein* (1922), from the collection of the Royal Society, London.


Information Modulates Appreciation of New Media Art

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Abstract
The present study aimed to ascertain the extent to which information influenced laypeople’s liking of Video Art. Fifty participants viewed 12 Video Art clips with or without information, and were asked to rate their liking for each of them. Our results show that when participants viewed the artworks with information, their liking ratings were higher than when they saw them without information. We also found that the liking for the video works was modulated by participants’ general interest in art. Our work shows that some of the results found in similar studies, which have usually focused on the aesthetic appreciation of pictorial works, extend to the domain of the New Media Art.

Keywords: aesthetic appreciation, new media art, video art, information.

Introduction
A movement aiming to reexamine the concept of Aesthetic Experience in contemporary art is recently gaining momentum in the field of Empirical Aesthetics (Minissale, 2013). This movement supports the view that aesthetic experience is markedly influenced by the context in which the artwork is received (Brieber et al., 2014), all elements that mediate its presentation, and the beholder’s previous knowledge (Carroll, 2008; Shusterman, 1997). Thus, it considers the aesthetic experience as a dynamic and evolving process, which is intimately linked to developments in the art world, such as the appearance of new media or artistic languages.

The present research is grounded on such views, and aims to determine whether, and to what extent, information influences laypeople’s liking of Video Art, an artistic language that has exploited the affordances of moving images since the 1960s. In order to achieve our research goals, we asked participants to view twelve video works accompanied, or not, by information offered by a Spanish Video Art distribution platform about the artworks in its catalogue. In addition, using video works as stimuli allowed us to avoid the issues derived from not being able to present the original artwork to the participants, as is commonly the case when doing research on traditional languages, like painting, sculpture, and so on.

Methods
Participants
Fifty participants (25 women) volunteered to take part in this study. Their ages ranged between 17 and 62, with mean of 36.8 years (SD = 13.2). Participants were recruited using a snow-ball method, and were, for the most part, residents in the Balearic Islands, Spain. Close to half of the sample had no university studies (42%), whereas the rest had received some sort of university education, ranging from a degree (34%) to master or PhD (18%).

Materials
Twelve pieces of Video Art were selected from the catalogue of a Spanish Video Art and Electronic Arts distributor. This catalogue had been assembled by a committee of experts on New Media Art to reflect the recent movement of these art forms in Spain. The selected materials were pieces produced in the last 15 years that included moving image and sound. In order to avoid interference with the texts provided as part of the experimental procedure, no video containing written texts were selected. Artworks that included offensive images or messages were also excluded from the pool, as well as any pieces that might be familiar to the participants. Aiming to standardize of viewing time, only videos lasting between 30s and 2 minutes were chosen. The final sample contained stimuli between 30 and 104 s (M = 68.2s).

A brief text of 100 to 150 words was composed for each of the videos, including information about the work. The description provided by the distributor of the videos was used as the source for these texts. Given that such descriptions had been elaborated by New Media Arts experts, the validity and reliability of the texts we provided the participants during the experiment was ensured. The only alteration to the original information was the expression in laypeople’s terms of complex technical vocabulary. Biased, offensive, or ideological information was excluded from the texts presented to the participants. Thus, the final selection of texts for the experiment contained information relative to four aspects: (i) the work’s iconography, iconology, and visual resources; (ii) formal, technical, and stylistic aspects; (iii) the artwork’s theme and content, notes on its meaning and message; (iv) the piece’s historical, social, cultural, and political context.
Procedure

Participants were greeted and informed of the procedure before it began, and assured that their data would be treated confidentially. Thereafter, they provided demographic information relative to sex, education, specific art training, and place of residence. Next, participants were asked to rate on a 1 (none) to 9 (maximum) scale their general interest in art, understood as their motivation to visit art museums, fairs, to read art-related periodicals and magazines, and so on.

After this, participants viewed each of the videos on a 17-inch computer screen and rated each of them on a 1 to 9 liking scale, ranging from “I absolutely did not like it at all” to “I absolutely liked it very much”. Each participant viewed half of the videos without information, and half of them after reading the corresponding information texts described above. All participants viewed the 6 videos without information before the 6 videos with information. This decision was made to avoid participants being influenced by general aspects of the information provided with some videos when viewing the ones shown without information. However, not all participants viewed the same videos with and without information. Participants were pseudo-randomly assigned to two equal-sized groups: A and B. Six of the videos were viewed by group A with no information and after receiving information by group B. The other six videos were viewed before receiving the corresponding information by group A and with no information by group B. After the experiment had finished, participants were asked whether any of the artworks was familiar. Given that none of the participants was familiar with any of the works, this information was not used in the subsequent analyses.

Results

The examination of the descriptive statistics indicates that participants liked videos more when they were preceded by the informative texts (\(M = 5.59, SD = 2.24\)) than when they were shown without any information (\(M = 4.82, SD = 2.28\)). Given the small pool of stimuli, we opted to perform the statistical analyses using non-parametric tests. Thus, Wilcoxon’s test revealed that the differences between both information conditions (with/without) had a significant effect on liking ratings [\(V = 22271, p < .001\)]. To test whether the assignment of participants to one or the other group had affected these results, we analyzed participants’ responses in each group separately. This showed that, in both groups, participants had awarded higher liking ratings to the videos preceded by information (\(M_A = 5.89, SD_A = 2.25; M_B = 5.12, SD_B = 2.27\)) than to those that were not (\(M_A = 5.30, SD_A = 2.19; M_B = 4.46, SD_B = 2.24\)) (Figure 1). In both cases, these differences were statistically significant [for group A: \(V = 5278, p < .001\); for group B: \(V = 5927, p < .001\)].

An additional analysis was performed to understand the factors that contributed to these liking ratings, which included—in addition to the information participants received—their sex, age, education, general interest in art, assigned group, and the order in which the videos were presented. In this case we used linear mixed effects models, which enable simultaneously examining within- and between-subjects variance (Baayen, Davidson & Bates, 2008; Nezlek, 2001; Silvia, 2007). The analysis was performed within the statistical environment R (R Development Core Team, 2008), using the function lmer() of the ‘lme4’ package (Bates, Maechler & Bolker, 2013). All regression parameters were estimated using Restricted Maximum Likelihood, all categorical variables were dummy coded, and all continuous independent variables were grand-mean centered. Following Barr, Levy, Scheepers and Tily’s (2013) recommendations, we attempted to model the model’s maximal structure. The model, thus, aimed to predict liking ratings awarded by each participant to each of the videos from the presence or not of prior information, participants’ assigned group, sex, age, education level, general interest in art, and the order of the videos.

The model output indicated that participants’ liking ratings were not significantly influenced by the order with which the videos were presented (\(t = 1.09, p = 0.249\)), their sex (\(t = 1.36, p = .145\)), age (\(t = 0.10, p = 0.912\)), or education (all \(ts < 1.62\), all \(ps > .068\), uncorrected for multiple comparisons). Participants’ liking for each video was predicted by whether they were preceded by information or not (\(\beta = 1.48, t = 2.19, p < .03\)), the assigned group (\(\beta = .069, t = 1.90, p < .05\)), and participants’ general interest in art (\(\beta = 0.28, t = 2.55, p < .01\)). The first two predictors confirm the non-parametric analysis reported above, namely, that information increased liking, and that participants in group A generally awarded higher liking ratings than participants in group B. The third

![Figure 1: Mean liking ratings as a function of condition (with and without information) and group. Error bars indicate 95% confidence intervals.](image)
predictor indicates that general art interest had a significant effect on the liking ratings, in the sense that, the more participants were generally interested in art, the higher the liking ratings they awarded (Figure 2).

Figure 2: Predictive relation between general interest in art and liking ratings for the video. Shaded region indicates 95% confidence interval of the slope.

The analysis of the random effects revealed that although there was similar variation in the intercepts across participants ($\sigma^2 = 0.97$) and stimuli ($\sigma^2 = 0.70$), there was much more variation in the effect of information on liking scores among videos ($\sigma^2 = 0.21$) than among participants ($\sigma^2 = 0.000$). This suggests that although the positive effect of information on liking ratings was common among participants, it varied considerably depending on the video. Table 1 presents the slope of the effect of information for each of the videos individually, ordered from lowest to highest, with each corresponding 96% confidence interval.

<table>
<thead>
<tr>
<th>Video</th>
<th>Information $\beta$</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>0.61</td>
<td>0.03, 1.18</td>
</tr>
<tr>
<td>7</td>
<td>0.82</td>
<td>0.25, 1.40</td>
</tr>
<tr>
<td>8</td>
<td>0.87</td>
<td>0.29, 1.45</td>
</tr>
<tr>
<td>9</td>
<td>1.05</td>
<td>0.47, 1.63</td>
</tr>
<tr>
<td>10</td>
<td>1.06</td>
<td>0.48, 1.64</td>
</tr>
<tr>
<td>11</td>
<td>1.21</td>
<td>0.63, 1.79</td>
</tr>
<tr>
<td>12</td>
<td>1.40</td>
<td>0.82, 1.98</td>
</tr>
</tbody>
</table>

Table 1. Slope of the effect of information for each of the 12 videos used in this study, ordered from lowest to highest, with each corresponding 96% confidence interval.

In order to understand the source of this variation in the effect of the information on liking ratings, we analyzed the correlation between the slope of the effect and the average liking for each video when presented without information. If this correlation were positive, it would indicate that the provided information had a greater effect on the most liked videos. If this correlation were negative, it would indicate that information had a greater effect on the initially least liked videos. Given the small number of items under consideration, we used Spearman's non-parametric correlation. The result of this analysis shows that the correlation is negative and very strong ($r_s = -0.84, p < .0001$). This indicates that the observed variation in the effect of the information on liking ratings among the videos is related to the variation in participants' liking for the videos when presented without information. Thus, the information increased liking for Video Art clips, though especially for those that were initially liked less without information. There was little effect of information in the case of videos that are liked without information anyway.

**Discussion**

Our results have shown that texts that aim to enhance the understanding of Video Art clips led to a significant increase in liking scores. Despite differences in general liking scores between the two groups to which participants were assigned, the artworks were liked more when participants had information about them. Our results also show that liking was unaffected by participants’ sex, education, or age, but greatly influenced by their general interest in art. The more participants were interested in art, the more they liked the videos included in this study. Finally, our results also show that whereas these effects are very stable among participants, meaning that they were all susceptible to the effects of information to a similar extent, the effect of information varied from one video to another. The effect of the informative texts was weakest for those Video Art clips that were generally liked in the absence of information, and strongest for those that were generally disliked in the absence of information.
In general lines, these results support the hypothesis that the gratification from the cognitive processing of artworks is enhanced by the presence of information, and thus is a crucial aspect of the Aesthetic Experience, as predicted by psychological models (Leder et al., 2004; Tinio, 2013). In addition, our work extends to the domain of the New Media Art some of the results found in similar studies that have traditionally focused on the aesthetic appreciation of pictorial works (e.g. Belke et al., 2006), and suggest that future studies should take into account participants’ general interest in art, and the differences in general liking among the stimuli used.

**References**


An International Perspective of Art Experience: Attitudes, Motivations, Emotions, and Learning Processes as Predictors of Museum Visits for Young People

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Abstract
The aim of this research was to conduct a survey to investigate which psychological factors, amongst attitudes, motivations, emotions, and learning processes predict museum visits of young adults. The study comprises data from 8 countries: Austria, France, Hungary, Italy, New Zealand, Portugal, Taiwan, and the USA. A questionnaire was administered to 2,247 participants from all over the Countries. Findings show differences among Countries in terms of museum visits attendance and typology of museums. To consider all the variables, three structural equation models were run. In sum, museum visitation was predicted by previous museum visits in autonomous way and with one own’s family. Intrinsic motivations and positive attitudes to museum are related to intention to future visit.

Keywords: Museum visits; young adults; motivations; emotions; learning processes.

Introduction
Museums are often described as informal means of learning, with the potential to offer different kinds of knowledge, from art to history, from science to technology (Bartels & Hein, 2003; Nardi, 2004). University students, during their academic career, can gain important benefits from the museum visit experience; in addition to knowledge, it can provide different perspectives of the world useful to enrich their mental openness.

The literature concerning museum visitor studies has shown that there may not be much of an attraction in these temples of culture for adolescents and young adults. In the USA in 2008, a large-scale survey on public participation to different cultural events reported that only the 12.9% of Americans between the ages of 18 and 24 years visited at least one museum during the previous year (Williams & Keen, 2009). In Germany, about the 23% of young people between 15 and 25 years reported visiting at least one museum of art, science, or history during the previous 12 months of the survey (Kirchberg, 1996). These findings have been confirmed by other data around the world: in France, people between 15 and 24 years corresponded to about 15% of visitors (Lemerise, 1999); in Australia and New Zealand, art museum visitors between 20 and 29 years formed 26% of the population (Mason & McCarthy, 2006). These results suggest that in different parts of the world, museums do not attract very many young people.

There are a number of reasons that may explain this lack of interest. Young adults often see museums as a place for old people, more focused on the past, while their interests and needs are more oriented to the present and the future (Shrapnel, 2012). What often leads this group to attend a museum is not real interest, but a mere curiosity or “duty” that forces them to take part in an experience. Without being accompanied by a genuine desire, attendance is related to attitudes of indifference (Bartlett & Kelly, 2000). Many young people made the equation museum = school; both are places to acquire knowledge regarding a great number of subjects (art, science, history, anthropology, etc.). Regarding the learning process, it might be difficult for them to distinguish museum from university; the risk is that museums are seen as an addition to their learning workload and therefore look very unattractive and boring.

Bearing in mind all of these explanations, it is important to understand the low interest manifested by young adults towards museums.

The aim of this research is to conduct a survey to investigate which psychological factors, amongst attitudes, motivations, emotions, and learning processes predict museum visits of young adults. An important aspect of the study is to have a network of researchers from different Countries in order to collect data in an International perspective. The study has been funded by and is based at the University of Roma Tre; it comprises data from 8 countries: Austria, France, Hungary, Italy, New Zealand, Portugal, Taiwan, and the USA.

In particular, we intended to individuate which factors can predict museum visits from young people. We had three main objectives:

1) Individuate predictors of museum visit in the last year and conduct an evaluation of the visit;
2) Individuate predictors of future intention to visits and the estimated usefulness of the visit;
3) Individuate predictors of future intention to visits and usefulness of museum visit for the young people who did not visit a museum in the last 12 months.

**Method**

**Participants**
Participants were 2,247 undergraduate university students of different Faculties (Education, Psychology, Sociology, Literature, but excluding students from Art Faculties), aged 18-30 (72% female). In Table 1 is shown the number of participants for each Country.

<table>
<thead>
<tr>
<th>Country</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>217</td>
</tr>
<tr>
<td>France</td>
<td>649</td>
</tr>
<tr>
<td>Hungary</td>
<td>269</td>
</tr>
<tr>
<td>Italy</td>
<td>652</td>
</tr>
<tr>
<td>New Zealand</td>
<td>71</td>
</tr>
<tr>
<td>Portugal</td>
<td>213</td>
</tr>
<tr>
<td>Taiwan</td>
<td>176</td>
</tr>
<tr>
<td>USA</td>
<td>70</td>
</tr>
</tbody>
</table>

**Measure**
A questionnaire was designed for the research to explore socio-demographic variables (included parents education level), personality traits, art education, modalities in which they were used to visit museum in the past (with school, family, and autonomously), numbers and typology of museum visited in the last 12 months, the experience of museum visits with particular reference to motivation, attitudes, emotional experience, and learning processes. The questionnaire was administered either as paper and pencil or online using the LimeSurvey platform. The paper and pencil questionnaire was administered to the students after the end of the classes; completing the questionnaire took an average of about 20 minutes. Regarding the administration through the LimeSurvey platform, students were invited to participate via email including the link to the online questionnaire. The collection of data started in May 2012 and finished after about 10 months.

**Data Analysis**
In addition to descriptive data analyses, we adopted a structural equation model (SEM) approach to test which predictors are more related to museum fruition in line with the three aims of the study, three regression models, were carried out.

**Results**
Descriptive analyses. Results showed that about 24% of the all participants had not visited any museum in the past 12 months; in Table 2 is shown the percentage of museum visits in the last 12 months.

<table>
<thead>
<tr>
<th>Visit number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No visit</td>
<td>24.1</td>
</tr>
<tr>
<td>1</td>
<td>23.1</td>
</tr>
<tr>
<td>2-3</td>
<td>30.3</td>
</tr>
<tr>
<td>4-5</td>
<td>11.7</td>
</tr>
<tr>
<td>5 or more</td>
<td>10.7</td>
</tr>
</tbody>
</table>

Concerning the people that did not visited any museum in the last 12 months, there were quite great differences among countries; participants from Taiwan and Austria reported the highest numbers of visits (Tab. 3).

<table>
<thead>
<tr>
<th>Country</th>
<th>No Visits</th>
<th>1</th>
<th>2-3</th>
<th>4-5</th>
<th>&gt;5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>10.1</td>
<td>11.1</td>
<td>30.9</td>
<td>20.7</td>
<td>27.2</td>
</tr>
<tr>
<td>France</td>
<td>31.3</td>
<td>19.6</td>
<td>29</td>
<td>12</td>
<td>8.2</td>
</tr>
<tr>
<td>Hungary</td>
<td>5.2</td>
<td>43.9</td>
<td>23.8</td>
<td>13</td>
<td>14.1</td>
</tr>
<tr>
<td>Italy</td>
<td>32.5</td>
<td>26.2</td>
<td>27.9</td>
<td>7.2</td>
<td>6.1</td>
</tr>
<tr>
<td>New Zealand</td>
<td>14.1</td>
<td>32.4</td>
<td>39.4</td>
<td>5.6</td>
<td>8.5</td>
</tr>
<tr>
<td>Portugal</td>
<td>32.9</td>
<td>16</td>
<td>32.4</td>
<td>9.9</td>
<td>8.9</td>
</tr>
<tr>
<td>Taiwan</td>
<td>5.4</td>
<td>12.6</td>
<td>48.5</td>
<td>19.2</td>
<td>14.4</td>
</tr>
</tbody>
</table>

Concerning the typology of museums, Modern art museums were visited more than other types of museums (39%), followed by Demographic museum (30%), Ancient art (27%), Archeological sites (21%), House museum (20%), Science museum (17%) and Architecture (17%). Participants reported a good level of satisfaction with their museum visits in the last year (M 3.7, SD 0.8, on a 5 points scale). They reported also a good level of learning from the museum visit (M 3.2; SD 0.9).

Participants reported to have had more art training at school than out of school, even if the difference is not so big, respectively 2.86 (SD=.86) and 2.65 (SD=1.2).

Overall, the most prevalent emotions associated with museum visitation were curiosity, interest, and pleasure; however, emotions varied according to the kind of museum visited, with aesthetic enjoyment for ancient art, aesthetic enjoyment and interest for modern art, and fun and curiosity for science museums.
Structural Equation Models. To consider all the variables, three structural equation models were run. In the first model (Fig. 1) we regressed visit/s and satisfaction for the visit/s on the openness to experience (personality trait defined by two items of TIPI scale), family factor (defined by family education level – average between mother and father – and museum visits with the parents), school factor (defined by art education at school and museum visits with the school), autonomous fruition (defined by visit with friend/s, partner, or alone), internal motives to visit museum (defined by 4 item of motives scale: pleasure, interest, cultural enrichment, and experienced emotions), and external motives (defined by 3 item) for museum visit/s in the past year and satisfaction for the visit/s.

Considering the overall information stemming from the different fit indices, the model satisfactorily fitted: $\chi^2(110) = 496.21, p < .001$, RMSEA = .050 (90% CI for RMSEA: .045–.055), NNFI = .94, CFI = .95. Findings indicated that museum visit in the last 12 months was related to previous museum visits in autonomous way ($\gamma = .55$, $p < .01$), family factor ($\gamma = .15$, $p < .05$), and intrinsic motives ($\gamma = .15$, $p < .05$). Visit satisfaction over the last 12 months was related to intrinsic motives ($\gamma = .55$, $p < .01$) and marginally to family factor ($\gamma = .09$, $p = .05$), and negatively related to external motives ($\gamma = -.09$, $p = .05$). Non-significant predictors of the visit and satisfaction were the Big Five openness, and school factor.

In the second structural equation model (Fig. 2) we regressed intention to museum visit in the next 6 months and the visit utility estimated by the subjects in relation to their work, on visit in the past 12 months, satisfaction, learning received during the visit/s, positive attitude towards museum visit (defined by 4 item of attitude scale), negative attitude (defined by 4 item), pleasure felt during the visit/s in the last year (defined by an aggregate measure, average of 3 item: pleasure, wellness, and aesthetic enjoyment), interest (defined by an aggregate of 4 item: wonder, interest, curiosity, and activation), and negative emotion (defined by 2 item: melancholy and distress) felt during the visit/s. The fit can be considered very acceptable: $\chi^2(81) = 467.18, p < .001$, RMSEA = .054 (90% CI for RMSEA: .050–.059), NNFI = .95, CFI = .97. Visit intention in the future 6 months was predicted by visit in the past year ($\gamma = .23$, $p < .01$), positive attitude ($\gamma = .14$, $p < .01$), pleasure felt in the past visit ($\gamma = .12$, $p < .05$), interest felt in the past visit ($\gamma = .12$, $p < .01$), marginally negative emotions ($\gamma = -.12$, $p = .05$), and, negatively, to negative attitude ($\gamma = -.36$, $p < .01$).

Significant predictors of the esteem of the utility of museum for educational professions was only positive attitude towards museum ($\gamma = .58$, $p < .01$). Satisfaction of the visit in the past year did not result as predictors of either future intention or utility.

The third model (Fig. 3) had the aim to individuate significant predictors to intention to future visit and museum utility (as for the second one) only for those participants which claimed to had never visited museum in the last 12 months. Therefore we regressed intention and utility to family and school factors, autonomous past visit/s, lack of interest to go museum (defined by 1 item of motives-not-to-go scale), external motives not-to-go (defined by an aggregate score of 3 items: lack of opportunity, time, information), motives not-to-go related to the museum (defined by 2 item: ticket price, hours of opening), positive and negative attitude (both defined by an aggregate indicator), anticipated positive and negative emotion (both defined by an aggregate indicator).
The model presents a very good fit: $\chi^2(47) = 78.85$, $p < .005$, RMSEA = .040 (90% CI for RMSEA: .026–.054), NNFI = .96, CFI = .98. Results indicate that, for people who do not visit any museum in the last year, intention to future visit is significantly related to autonomous past visit/s ($\gamma=.29$, $p<.01$), positive attitude ($\gamma=.16$, $p<.01$), positive anticipated emotions ($\gamma=.14$, $p<.01$), and negatively related to lack of interest ($\gamma=-.13$, $p<.05$), and negative attitude ($\gamma=-.21$, $p<.01$). Esteem of utility of museum was significantly related to positive attitude ($\gamma=.34$, $p<.01$) and negatively to negative attitude ($\gamma=-.21$, $p<.01$), and, unexpectedly, autonomous past visit ($\gamma=-.11$, $p<.05$). School and family factors, motives-not-to-go related to the museum, and anticipated negative emotions did not predict either future visit intention nor utility of museum, for the students which did not visit any museum in the last 12 months.

**Discussion**

Findings from the present research show that previous museum visits in autonomous way (with friends, partner, and/or alone) as well as with one own’s family are the best predictors of museum visit in the past 12 months. Also intrinsic motivations and positive attitudes to museum, such as the interest for the artist, the desire for cultural enrichment appear to be good predictors of the museum visits in the last year; the pleasure felt during the visit, and the emotions experienced are related to intention to future visit. Emotions such as aesthetic enjoyment, curiosity and interest play also an important role towards the museum experience. The satisfaction linked to museum visits is related to intrinsic motives and to the family factors: the more people express interest, emotion and desire of cultural enrichment the more they are satisfied with the museum visits. Our findings show that museum visit experience carried out with the school are not so important as the museum visits conducted in autonomous way or with the family. It emerges a sort of family factor that is related to the museum visits conducted in the past year and also to the intention to visit museum in the next future. To encourage young people to attend museums, the school should focus more on the motivational, attitudinal and emotional aspects for the enjoyment of art; school should also involve families in stimulating motivational interest of the children to art and cultural exhibitions.

We must highlight the limitations of the research, emphasizing the fact that this is a correlational study, therefore it is a bit risky to speak of true predictors. Further research should investigate the relationship between significant variables of the predictions in a field situation (e.g. in the museum) and through an experimental or semi-experimental design. One of the main merits of the present research is to have analyzed different features such as individual, social, and educational factors in order to individuate which factors lead young people to visit museum and cultural settings. The aim is to provide indications to school and other social institution to incentivize young people museum visits. Furthermore, this survey was conducted collecting data from many Countries in different Continents. Further analysis of our database will be focused on the comparison of samples from different Countries in order to highlight possible differences and similarities. Preliminary analysis showed that the predictive relationships between the variables are very similar amongst the different samples, but such evidence must be tested statistically. It would then be possible to generalize both results and applicative implications.

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**References**


Visual Preference for Curvature as a Potential Aesthetic Primitive

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Abstract
From an evolutionary perspective, aesthetics has been understood as a human-derived trait. Aesthetics could be seen as an evolutionary consequence of a series of old forms of complex problem solving (Johnson, 2012). Preference for curvature could be interpreted as part of some of these forms and considered as an “aesthetic primitive”. We designed an experimental procedure with the assumption of responses of approaching or avoiding the stimulus. The objective was to test the effect in a wide variety of cases: different exposure times, non-Western populations, using real objects and silhouettes, and other primates. The preliminary data as a whole indicated that the effect is present in all these groups and that the exposure time is critical.

Keywords: Evolutionary Aesthetics; Evolutionary Psychology; Experimental Aesthetics; Visual Preference.

The Emergence of the Aesthetic Trait

Aesthetics is one of the most significant terms for the International Association of Empirical Aesthetics (IAEA). Usually, the meaning of the term basically follows that Baumgarten first gave to it, that is, related to taste or “sense of beauty”. However, aesthetics currently has several meanings, all of them related to each other and of great interest for the IAEA. From an evolutionary point of view, we refer to it as a functional trait unique to Homo sapiens. From a psychologist’s point of view, it can be defined as an internal experience or a neuro-cognitive process related to Baumgarten’s concept. From a more psychosocial viewpoint, we can, for instance, argue that aesthetics is a necessary actor in the understanding of art. In this communication, we are especially interested in the phylogenetic emergence of this trait as an internal experience—and its relation to neuro-cognitive processes—that gave rise to particular behaviours, including artistic activity.

In the field of empirical aesthetics, inquiry into cognitive and neural correlates of aesthetics has generally been carried out without considering an evolutionary perspective. In a previous article (Zaidel, Nadal, Flexas & Munar, 2013), we expounded that a comprehensive characterization of the—behavioural, cognitive and neural—underpinnings of aesthetic experience requires understanding its evolution. Therefore, the challenge would be to characterize the evolutionary modifications to the underlying systems with greater detail and to determine the way they coevolved.

Elsewhere, we have also argued that the activity of several cognitive processes and brain regions sustains and provides the aesthetic experience and, therefore, it is unlikely that a single evolutionary event had altered them to give rise to the aesthetic experience. It seems more plausible that this kind of experience was the outcome of gradual changes throughout our phylogenetic evolution due to diverse selective pressures.

From an embodied approach, Johnson (2008, 2012) argues that aesthetic experience would not be primitively different from other sensorimotor or behavioural experiences such as moral, religious or scientific experiences. All of them would emerge as a result of complex problem-solving systems and would direct our interaction with the environment in specific ways for each of these kinds of experience. Only a posteriori would higher cognitive processes mediate these experiences and interpret them. We would then refer to a particular experience as aesthetic, moral, religious or scientific only after higher cognitive mediation and interpretation. In this way, we give a certain name to an experience depending on the specific processes that had participated in solving the primary problem, the elements that had taken part in these processes and the subjective impression created by the situation.

Within this framework, we hypothesize that some visual preferences would be set up to solve specific problems quickly. These situations would give rise to what could be categorised as “aesthetic decisions” after losing their relation with the original circumstances, and being used in other contexts. In other words, these preferences could be some of the ancestral constituents of what has been called the “aesthetic trait” from an evolutionary perspective. In this regard, they could be called “aesthetic primitives”.

However, while this term was inspired bit its use in Richard Latto’s The Brain of the Beholder (1995), we would like to specify that the meaning we give this construct is not exactly the same his. Latto used ‘primitive’ as the stimulus or property of a stimulus that is intrinsically interesting, even in the absence of narrative meaning, because it resonates with the mechanisms of the visual system processing. He proposed some aesthetic primitives: patterns of lines, geometrical shapes, stylized organic forms, the human body, the human
face, the human hand, stick figures, monochromatic blocks, landscape features, zigzags, stripes, and the principal axes of objects, among others. Purely abstract artwork would consist of isolating and exaggerating these aesthetic primitives as if they were elementary units of the art and, by extension, of the aesthetics.

Therefore, Latto linked the term ‘primitive’ to a supposed psychobiological origin of the aesthetic experience that is automatically triggered when facing specific forms, which he called ‘aesthetic primitives’. We propose to connect the term ‘primitive’ to a hypothesized phylogenetic and evolutionary origin of the aesthetic human trait. In order to progress in this proposal, we have decided to focus on a few specific units that provoked the emergence of this trait.

Latto also considered that these particular forms are aesthetically moving, not because they reflect the properties of the world, but because they reflect the properties of our brains. We think that this explanation is only a partial view, as one cannot detach “the properties of our brains” from “the properties of our world”. So, according to an embodied approach and maybe a Kantian perspective, we adopt a more transcendental sense of this relation. In our case, there is an embryonic link between the properties of our brains and the properties of our world. Behavioural and evolutionary processes could account for the emergence of this link and subsequent adjustments. We are interested in the behavioural processes related to this link, which would be the same that gave rise to the emergence of the aesthetic trait in our ancestors.

On the other hand, Latto understands that some aesthetic primitives may be universal because they are genetically determined, while others may depend on particular learning experiences and would therefore be culturally determined. In this sense, once again, our conception of the construct does not coincide with Latto’s. We think that the mechanisms that underlie “universal primitives” cannot be similar to those underlying “learned primitives”. The psychophysical characteristics of universal and “learned” primitives must be different due to their different biological implementation, among other reasons. Using cognitive terminology, universal primitives should be considered as low level in the visual processing, whereas the learned ones would have higher cognitive involvement. Accordingly, their contribution to general aesthetics and the arts must be different. Moreover, aesthetics as a trait is universal among human beings; thus, when looking for the primitives of this trait, we must look at the universal features.

In short, we refer to the aesthetic primitives as the phylogenic constituents that gave rise to the aesthetic trait and they are simultaneously properties of our brain and properties of our world. Some, if not most, of these constituents would be perceptive preferences. There would be another kind of constituents that would come from reflections and interpretations a posteriori about decisions based on these preferences, but applied in different circumstances. From an empirical point of view, one of the first steps to verify this line of argument is to check whether the proposed candidates could be aesthetic primitives. Hence, there is interesting empirical work to be done. For example, we think that these ancient visual preferences should still be influencing our current behaviour to some measure. However, as mentioned, they must be universal and acting at a low level in the visual system. They may also have been shared with our closer relatives in evolutionary terms.

With the aim of testing this line of reasoning, we attempted to identify some of these preferences. Thus, we focused on the visual preference for curved contours versus sharp-angled ones (Bar & Neta, 2006, 2007). Other candidates could be preference for symmetry, for regularity, for specific colours, brightness or complexity.

**Visual Preference for Curvature**

Preference for curved contours has been shown in several studies (Leder & Carbon, 2005; Bar & Neta, 2006, 2007; Silvia & Barona, 2009; Leder, Tinio & Bar, 2011, Westerman et al., 2012; Vartanian et al., 2013, among others). We have initiated a research line to examine the possibility of considering this preference as an “aesthetic primitive”.

We designed an experimental procedure using a simple two-alternative forced choice task (2AFC), designed so to convey a sense of approaching the chosen stimulus. The objective of the design was to test the preference for curved contours in a wide variety of cases: non-Western populations and other primates, especially. We used a subset of black and white images of real objects previously employed by Bar and Neta (2006). Images were paired to build 36 target pairs, each one consisting of two versions of the same object mostly differing in its contour: curved or sharp (Figure 1). 36 distractor pairs were used, consisting of different objects with a similar overall shape but different semantic meaning (Figure 2).

![Figure 1: Example of a target pair (from Bar & Neta, 2006).](image-url)
images. The objective of the two blocks was to control the possible effects of lateralization.

Participants were instructed to select one of the two images using a 2AFC. The instructions specifically avoided the use of words like wanting, liking or preferring. This procedure assumes the act of approaching or avoiding the stimulus by enlarging the chosen image. The goal of the design was to test the effect in a wide variety of cases.

A trial consisted of a fixation cross being shown for 500 milliseconds (ms) followed by a pair of stimuli displayed, for a given time, depending on the experimental condition. These images were immediately replaced by a pair of light grey squares, which reminded the participant of the need to make a choice while minimizing possible after-effects (Figure 3). Once one of the images was selected, it was shown again for 1 second, centred, and at twice its original size. As discussed elsewhere (Munar, Gómez-Puerto & Gomila, in press), this design reflects the act of approaching the preferred image, thus minimizing the need of semantic processing and facilitating the replication among different cultures and species. Nevertheless, it is obvious that with other species some modifications are needed, such as the use of a touch screen or rewards with chimpanzees and gorillas.

At the moment, we already have some results from a wide array of experiments. By modifying the exposure times, we found that a significant effect of preference for curved contours was found at 40 and 80 ms, but not at 150, 300, 500 ms or in free time. However, these data are only preliminary.

We also have some results with participants from rural areas in Ghana (Bawku, Upper East Region) and Mexico (Oaxaca) which showed a significant effect with short presentation times.

Further testing in which geometrical figures were used with two configuration levels —global and local— did not show the effect in the local configurations, but they did so in the global configurations that required applying the gestalt principle of closure (Figure 4).

Finally, we have some preliminary results from chimpanzees and gorillas employing images of real objects, in which a significant effect of preference for curvature was found using free exposure times. These results, together the fact that humans do not show significant at longer exposure times, seem to point to some kind of interaction between the preference for curvature and higher cognition in humans.

Conclusions

The aforementioned results taken together seem to confirm that the preference for curved contours—or the avoidance of sharps ones— has ancient origins and could be a good candidate for an aesthetic primitive.

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References

The Human Contribution to the Experience of Art in the Museum

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Abstract
In the common psychological laboratory setting, artworks are treated as stimuli, the experience of art as a reactive task, and participants as passive responders. Thus, psychological research on the experience of art actually runs the risk of excluding many of the features that contribute to the experience. The appreciation of art is not a passive response to a series of works, but an active construction that relies heavily on what Dewey called “the human contribution”. In this study we examined the impact of the expectations, motives and education of spontaneous museum visitors on their experience of art. Our results suggest that people’s expectations about an art exhibition and motivations to attend, together with their education, contribute to shape their experience of art in the museum.

Keywords: art, aesthetic appreciation, museum, education, expectation, motive.

Introduction
In his Art and Experience, John Dewey (1934) emphasized the crucial role that context has in shaping the experience of art. This perspective is aligned with recent developments in cognitive science that go under the label of situated cognition, and recent empirical attempts to understand the way the experience of art is influenced by context. Indeed, researchers are increasingly performing their studies outside the laboratory, mostly in museums. Brieber et al. (2014), for instance, showed that art is liked more and found more interesting in the museum than in the laboratory. Dewey (1934) also stressed that the experience of art is not a passive response to a series of works, but an active construction that relies heavily on what he called “the human contribution”, by which he meant the features individuals bring to the encounter with art that make each experience unique.

Our aim in this study was to examine the impact of museum visitors’ motives to visit an art exhibition at a museum, their expectations about the visit, their general education, and their specific art expertise on their experience of the exhibited artworks. In order to do so, we asked spontaneous visitors to the Queens Museum of Art (New York) to take part in our study. Fifty-four visitors participated individually in the four stages it comprised. First, they were interviewed about their motives and expectations. Second, they were asked to walk around the first room in the exhibition and rate 10 of the exhibited artworks on 5 Likert scales: Arousal, valence, interest, understanding, and liking. Third, after the ratings had been handed back, and they had completed the rest of their visit, participants were interviewed about their overall experience of the museum visit. Finally, they completed brief art expertise and demographics questionnaires.

Results and Discussion
We used linear mixed effects models to analyze the data. Our results revealed that the main predictor of the responses to the rating scales was previous knowledge and interest in art, as measured by the final questionnaire. Moreover, independently of motives, expectations, and prior knowledge, participants’ liking for the artworks was predicted by interest, valence and understanding. We interpret these results in the light of models of aesthetic experience of art (Leder et al., 2004). Finally, we discuss the advantages of studying the experience of art with participants who are intrinsically interested in the art they are asked to view, and who differ greatly in terms of motives, expectations, education and art knowledge.

References
Aesthetic Evaluation of Metric Timing Patterns in Malian Jembe-Music

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Abstract
We report on two experiments conducted in Mali and Germany. A piece of Malian jembe-music called Manjanin (four beats, ternary subdivision) was used to explore (1) whether the timing of subdivisions is constitutive for the aesthetic value of the rhythm, and (2) if enculturation impacts preference judgments on timings (24 professional musicians from Bamako versus 32 music students from Cologne). Participants were asked to rate timing-manipulated versions of ensemble phrases in a pairwise comparison design. Results show that experts from Mali prefer a non-isochronous short-long-long metric timing pattern, and the group comparison reveals a strong influence of culture specific musical standards on preference judgments.

Keywords: Rhythm perception; musical preference judgments; comparative aesthetics; culture as source of variance.
**Drawing Faces Upside-Down Selectively Impairs the Ability to Draw the Vertical, But Not Horizontal, Spatial Relationships Between Facial Features**

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**Abstract**

Although art-educators advocate for the practice of drawing models upside down to improve accuracy, research has demonstrated that viewing face models upside-down causes impairments in the ability to perceive vertical, but not horizontal, spatial relationships between features. The present study assessed whether drawing upside-down faces causes a similar impairment in drawing accuracy. Non-artists drew a model face in both the upright and upside-down orientations. Congruent with patterns of perceptual impairment, the vertical spatial relationships were drawn less accurately in upside-down faces than upright faces. Accuracy of drawing the horizontal spatial relationships was not affected by model orientation. In contrast to assumptions guiding art-education practices, our results suggest drawing a model upside-down either has no effect or an impairing effect on drawing accuracy.

**Keywords:** observational drawing; face perception; face inversion; upside-down faces; art education

**Introduction**

Observational drawing is a visually-guided behavior where an individual attempts to render a recognizable depiction of a specific model stimulus they directly perceive. With respect to drawing faces, successful reproductions require that individuals accurately reproduce the individual facial features and the spatial relationships between those features as they appear in the model being copied. Accurately drawing faces is a task that individuals not trained in drawing have tremendous difficulty with. Typically, it takes extensive training and practice before individuals are capable of creating a recognizable reproduction of a specific face model (Cohen, 2005; Cohen & Earls, 2010). In the art education literature, many drawing instructors have discussed the potential effects that drawing an upside-down model may have on reproduction accuracy. Edwards (2012) famously advocated for beginning drawers to draw from upside-down models, arguing that model inversion has facilitating effects on drawing performance. She argued that viewing faces and other common objects in their canonical orientation engages top-down processes that interfere with the veridical encoding of the exact appearance of the object being perceived. Difficulty in accurately drawing a model in its canonical orientation, from this perspective, is caused by people drawing what they know about the appearances of the objects as opposed to what they directly see. Further, it was proposed that viewing common objects upside-down disrupts recognition processes and inhibits the activation of such top-down representations, thus allowing one to more accurately perceive and draw the exact visual appearance of a given object.

However, despite the wide-spread adoption of this technique by other drawing instructors (e.g. Garcia, 2003; Parks, 2003), the potentially facilitating effect of model inversion on drawing accuracy has not been empirically validated. Further, since the act of drawing begins with perceptually encoding the visual information attempting to be reproduced, the perceptual recognition literature on face inversion suggests that viewing face models upside-down might cause either no effect or an impairing effect on drawing accuracy, depending on the aspect of face drawing accuracy that is focused on. Such research has demonstrated that perception of the spatial relationships between features is impaired when exposed to upside-down relative to upright faces, but that perception of the isolated facial features themselves are not affected by face inversion (Cabeza & Kato, 2000; Freire, Lee & Symons, 2000; Goffaux & Rossion, 2007; Leder & Bruce, 1998; Leder & Bruce, 2000; Leder & Carbon, 2006; Searcy & Bartlett, 1996). This leads to the hypothesis that drawing an upside-down model face would have an impairing effect on the accuracy of the reproduction of the spatial relationships between facial features and no effect on the accuracy of reproducing the appearance of the individual features themselves. In perhaps the only empirical evaluation of the effect that drawing an upside-down model face has on reproduction accuracy, Cohen and Earls (2010) tested this hypothesis in a study where participants were asked to draw a photograph of a face whose orientation was either upright or upside-down. The accuracy of the drawings was measured by having a group of independent raters provide three subjective judgments pertaining to the accuracy of the drawings' reproduction of (1) the overall face, (2) the individual features independent of how accurately the spatial positioning of the features was reproduced, and (3) the spatial positioning of the features independent of how accurately the individual features were reproduced. Similar to the effects that face inversion has been observed to have during perceptual recognition and judgment tasks, Cohen and Earls (2010) found that drawings of the inverted faces were judged to have reproduced the spatial relationships between features with less accuracy than the
drawings of upright faces. Further, there was no effect of the orientation of the model with respect to the perceived accuracy of the reproduction of individual features or the overall face. Interestingly, this pattern was found for both expert and novice drawers, indicating that the impairing effect of face inversion on the reproduction of spatial relationships between features is equally experienced by skilled and unskilled drawers.

One limitation of the study reported by Cohen and Earl (2010) was that the drawing accuracy of spatial relationships between features was assessed by a single, holistic rating that did not discriminate between the different spatial relationships of the model face. Therefore, it is still somewhat unclear as to how face inversion affects the drawing of the spatial relationships between facial features. Is there an equal impairment in drawing accuracy across all reproduced spatial relationships between features, or is the drawing accuracy of some spatial relationships more affected by face inversion than others? It has been well established that face inversion disrupts the perceptual recognition of vertical spatial relationships (e.g. the vertical positioning of the eyes and mouth) to a much stronger degree than the recognition of horizontal spatial relationships (e.g. inter-ocular distance) (Crookes & Hayward, 2012; Goffaux, 2008; Goffaux & Rossion, 2007; Goffaux, Rossion, Sorger, Schlitz & Goebel, 2009). Thus, if the processing of the spatial relationships between features that guides drawing performance is affected by face inversion in the same way that perceptual recognition is, one would predict that drawings of vertical spatial relations should be impaired by face inversion to a greater degree than the drawings of horizontal spatial relations.

The current study aims to test this hypothesis. Here, we will describe an experiment that asked participants to draw a single photograph of a face twice, once while upright and once while upside-down. The drawings were objectively measured with respect to how accurately they reproduced two spatial relationships: the vertical distance between the eyes and mouth and the horizontal distance between the eyes.

Method

Participants

Thirty Brooklyn College undergraduate psychology students participated in this experiment for course credit (23 females), M (SD) age = 20.23 years old (3.30). All participants reported having no formal training in drawing.

Materials

Participants were asked to draw a standard photograph of a woman’s face shown in the frontal view (see Figure 1). The photograph was presented on a 17 in. computer monitor (Dell Model: 1704FPVt). When presented on the computer monitor, the photograph measured 7 x 9.5 in. In one condition (Upright Condition), the photograph was presented in the upright orientation. In the second condition (Upside-

Figure 1: The model face participants attempted to reproduce in the drawing task. (a) Upright Model; (b) Upside-Down Model

Down Condition), the photograph was presented as a 180 degree rotation of the upright photograph. Participants were provided with an 8.5 x 11 in. sheet of white paper, a sharpened No. 2 pencil with an eraser and a manual pencil sharpener to use to create the drawing.

Procedure

After providing informed consent, the participants received an explanation that they would be producing two drawings based on a photograph of a face. Participants were instructed that their goal in creating the drawings was to copy the photograph exactly as it appeared. They were further instructed that they should not add any details that were not present in the photograph and that they should not eliminate any important details that were present in the photograph. Furthermore, participants were instructed to draw the face as they see it presented on the computer monitor. Specifically, when drawing the upside-down photograph, they were asked to draw an upside-down face as opposed to trying to draw an upright face mentally rotated from the upside-down photograph. Finally, they were told that they could use the eraser and pencil sharpeners if they needed. Participants were given a 15 minute time limit to create the drawing, and the experimenter provided 5- and 1-minute warnings.

A repeated measures experimental design was employed, where participants drew the face in both orientation conditions. The order in which the upright and inverted drawings were produced was counterbalanced across participants.

For the model photograph and the two drawings produced by each participant, four measurements (A – D) were be made (see Figure 2). “A” was measured as the length of the head between the top of the head and the bottom of the chin. “B” was measured as the width of the head between the left and right top intersections of the ear and the face. “C” was measured as the vertical distance between center of the eye line and the bottom of the lower-lip. “D” was measured as the horizontal distance between the inner corners of the two eyes.
Based on these measurements, one vertical- and one horizontal-spatial relation ratio was calculated to determine the relative positioning of target facial features (see Figure 2). Ratio C/A quantified the vertical distance between the eyes and the mouth relative to the length of the head (Model Value = 0.32). Ratio D/B quantified the horizontal distance between the eyes relative to the width of the head (Model Value = 0.24).

Drawing errors were calculated for each of the two ratios as follows:

\[
\text{Drawing Error} = \text{Drawing Ratio Value} - \text{Model Ratio Value}
\]

Calculated in this way, positive drawing error values indicate that the distance between features was greater in the drawing than it was in the model.

### Results

Table 1 displays means and standard deviations of the drawing ratio values and errors. The first set of analyses aimed to describe the nature of the errors participants made when drawing the vertical distance between the eyes and mouth and the horizontal distance between the eyes. Specifically, we wished to determine whether the drawing errors participants made were systematically biased in a single direction or whether they randomly distributed around zero error. This was addressed by conducting a single-sample \(t\)-test comparing the distribution of errors for each spatial relation ratio to a test value of 0 error. Relative to the model, participants were found to systematically reproduce the eyes and mouth too far apart from each other in both the upright, \(t(29) = 6.64, p < .001\), Cohen’s \(d = 1.21\), and upside-down drawings, \(t(29) = 5.09, p < .001\), Cohen’s \(d = 0.93\). However, participants were not found to be systematically biased to draw the eyes too far apart or too close together relative to the model in either drawing. Rather, the errors in reproducing the inter-ocular distance were randomly distributed around 0 for both the upright, \(t(29) = 1.99, p = .06\), Cohen’s \(d = 0.36\), and upside-down drawings, \(t(29) = -0.93, p = .36\), Cohen’s \(d = 0.17\).

The next set of analyses aimed to determine whether the orientation of the model and drawing had an effect on the degree to which participants erred in drawing the two target spatial relationships. First, all errors were converted to absolute values. Then, for each spatial relation ratio, we performed a paired-samples \(t\)-test comparing the degree of absolute error between the upright and upside-down drawings. We found that errors in drawing the vertical distance between the eyes and mouth were significantly greater in the upside-down than upright drawings, \(t(29) = 3.06, p < .01\), Cohen’s \(d = 0.56\). In contrast, upright and upside-down drawings did not significantly differ with respect to the amount of error in reproducing the horizontal distance between the eyes, \(t(29) = 0.45, p = .66\), Cohen’s \(d = 0.08\).

Since the vertical distance between the eyes and mouth was measured as a proportion of the height of the head, it is important to establish that there were no head-height drawing biases that were confounded with the orientation of the drawing. As reflected by the “A” measurement, there was no significant difference in the reproduced head-height between upright and upside-down drawings, \(t(29) = 0.28, p = .78\), Cohen’s \(d = 0.05\). Further, since the horizontal distance between the eyes was measured as a proportion of the width of the head, it is also important to establish that there were no head-width drawing biases confounded with upright versus upside-down drawings. As reflected by the “B” measurement, there was no significant difference in how wide the head was reproduced between upright and upside-down drawings, \(t(29) = 1.63, p = .12\), Cohen’s \(d = 0.29\).

### Discussion

The present study demonstrated that face inversion has the selective effect of impairing one’s ability to accurately reproduce the vertical, but not horizontal, spatial relationships between features in a drawing task. These results help to clarify our understanding of the effects that face inversion has on processing the spatial relationships between facial features. Up until this point, the differential effect that face-inversion has on processing vertical and horizontal spatial relationships has exclusively been demonstrated through performance in same/different recognition tasks (Crookes & Hayward, 2012; Goffaux, 2008; Goffaux & Rossion, 2007; Goffaux, Rossion, Sorger, Schlitz & Goebel, 2009). Thus, it was unclear as to whether face inversion disrupted (1) the ability to perceptually encode the vertical spatial relations between features or (2) the ability to compare the vertical spatial relationships between two face stimuli, one that is directly perceived and one that is
stored in short-term memory. The use of a drawing task provided a method to study the effects face inversion has on a visually-guided behavior not dependent on a recognition process. By showing that vertical, but not horizontal, spatial relationships are reproduced with greater error when drawing upside-down compared to upright faces that remain continually visible throughout the entire task, we provide empirical support for the idea that face inversion selectively disrupts the process of encoding the vertical spatial relationships between facial features while not affecting the encoding of horizontal spatial relationships, at least for the purpose of guiding the production of a drawing.

Following this, our results more generally inform psychological theories of drawing performance. One of the most widely discussed theories of drawing performance is commonly referred to as the misperception hypothesis (Cohen & Bennett, 1997). This idea proposes that errors in observational drawing are largely caused by errors in the perceptual encoding of the model being reproduced. Our findings, in conjunction with those reported by Cohen and Earls (2010), provide empirical support for this theory, as we find that comparisons of drawing upright and upside-down faces result in patterns of error that are congruent with the patterns of error in perceptual recognition and judgment tasks. Namely, face inversion negatively affects the drawing and perceptual encoding of vertical spatial relationships between features, but has no effect on the drawings and perception of horizontal spatial relationships between features and the appearance of the individual features themselves.

Finally, our results bear on the empirical validation of art education practices. As discussed in the Introduction, many drawing instructors promote the practice of drawing models of common objects upside-down to improve the quality of the drawings (Edwards, 2012; Garcia, 2003; Parks, 2003). The results reported here and in Cohen and Earls (2010) provide no evidence that this practice is effective in improving drawing performance, at least with respect to the drawing of naturalistic images of faces. Rather, the empirical evidence to date suggests that drawing models turned upside-down has either no effect or a negative effect on reproduction accuracy. However, the perception of other types of common objects is not as negatively affected by image inversion as faces are (Yin, 1969). Thus, it remains open to question whether model inversion may facilitate performance in drawing objects that, perceptually, are known not to be strongly affected by viewing the object upside-down.

Acknowledgements

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References


Table 1. Descriptive Statistics for Upright and Upside-Down Drawings

<table>
<thead>
<tr>
<th></th>
<th>C/A Ratio (Vertical Distance Between the Eyes and Mouth Relative to the Length of the Head)</th>
<th>D/B Ratio (Horizontal Distance Between the Eyes Relative to the Width of the Head)</th>
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<tr>
<td></td>
<td>Mean Error Difference (SEM)</td>
<td>95% Confidence Interval Error Difference</td>
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<td>Model</td>
<td>M (SD) Ratio Values</td>
<td>M (SD) Error Drawing – Model</td>
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<tr>
<td>Upright</td>
<td>0.39 (0.04)</td>
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<tr>
<td>Upside-Down</td>
<td>0.41 (0.07)</td>
<td>0.06 (0.07)</td>
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Exploring Causes of Disagreement on Status of the Golden Section Hypothesis: 
A Methodological and Theoretical Consideration

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Abstract
This paper critically reviews psychological studies on the golden section hypothesis in experimental aesthetics and explores some causes of disagreement on the status of the hypothesis. In the history of experimental aesthetics since Fechner, the golden section hypothesis, according to which forms containing the golden section are most preferred, has been tested many times by various experiments. However, despite the long history of investigations (over 130 years), the results still contradict each other, and the hypothesis has not yet been conclusively confirmed or rejected. This paper reviews several examples of experiments on the hypothesis and identifies some methodological and theoretical problems concerning (1) the difference of stimuli, (2) the difference of tasks, and (3) the participants’ level of art expertise.

Keywords: the golden section hypothesis; aesthetic judgment; preference; methodology; theory

Introduction
If a and b represent the lengths of the shorter and longer segments respectively, the ratio a:b such that a:b = b:(a + b) is called the golden section. The golden section has been widely regarded as the most beautiful proportion and has been used in many works of art and in architecture since ancient times. In the history of experimental aesthetics since Fechner (1997 [1876]), the golden section hypothesis, according to which forms containing the golden section are most preferred, has been tested many times by various experiments (e.g., Godkwitsch 1974; Benjafield 1976; Höge 1997; Konečnì 1997; McManus et al. 2010), including some studies in neuroaesthetics (e.g., Di Dio et al. 2007). However, despite the long history of investigations (over 130 years), the results still contradict each other, and the hypothesis has not yet been conclusively confirmed or rejected. This paper examines and evaluates these studies on the golden section hypothesis, and points out some problems related to disagreement regarding the status of the golden section hypothesis.

Here is how this paper proceeds. First, this paper briefly reviews relatively recent experiments related to the golden section hypothesis since 1990s. Second, it summarizes the results of mentioned experiments, and evaluates the present state of the golden section hypothesis. Then it identifies the problems that may cause disagreement on the status of the golden section hypothesis. Finally it proposes some solutions to the problems.

The Golden Section Hypothesis and examples of experiments
The long history of the experiments on the golden section hypothesis started with Fechner’s one (1876). Fechner showed the participants 10 white rectangles on black background, each of which had different proportions (including the golden section) in the length of two sides, and asked them to choose the most and the least pleasing one. The result showed that the golden section rectangle was the most preferred one (with 35% of the participants’ choice), and Fechner concluded that the result supports the golden section hypothesis. After Fechner, however, although several experiments were performed on the golden section in the 20th century, the results contradicted each other (e.g., Haines and Davies 1904; Lalo 1908; Thordike 1917; Weber 1931; Godkwitsch 1974; Benjafield 1976).

Green (1995), a historian of psychology, argues that the golden section hypothesis is still maintained. He reviewed comprehensively psychological studies on the golden section from Fechner to the literature of 1990s, listed up conditions of studies (i.e. shapes of stimuli, orientations of stimuli, ranges of stimuli ratios, areas of the stimuli, methods to measure preferences (e.g. method of choice or method of production), ways of analyzing preferences (e.g. percentage of most preferred choice, mean rank of preference, and etc.), etc.), and compared the studies in terms of these conditions. Based on the comparisons, he concluded that the effect of the golden section exists although it is sensitive to the contexts.

Although Green’s review seems to clearly sum up the history of psychological studies on the golden section, the results of more recent studies still present disagreements on the status of the hypothesis. Some researchers argue that the golden section hypothesis is still maintained (e.g., Russell 2000a; Konečnì 2003, 2005; Di Dio et al. 2007) though some others reject it (e.g., Boselie 1992; Hekkert et al. 1994; Höge 1997; Davis 2007; McManus et al. 2010). This paper reviews some approaches and results of recent studies after Green’s review, i.e., (1) studies employing the method of choice of rectangles, (2) studies applying the method of production of objects, and (3) neuroaesthetic studies, in order to reconsider the current state of the studies.

First, this paper focuses on series of experiments using rectangles as stimuli, and adopting “method of choice” following Fechner. For example, Hekkert and his colleague (Hekkert et al 1994) showed several pairs of rectangles, among which there was a golden section rectangle, to non-
expert participants (i.e., students without education of visual arts) and art-experienced participants (i.e., students of art school), and gave them subjective instruction (i.e., to choose 'the most pleasing or attractive' rectangle) and objective instruction (i.e., to choose 'better proportioned or balanced' rectangle). As a result, when following subjective instruction, the non-expert participants mostly preferred the golden section rectangle, whereas the art-experienced participants mostly preferred the square (1:1). On the other hand, when following objective instruction, both non-expert and art-experienced participants mostly preferred the square. Although the results were partly supportive for the golden section, Hekkert and his colleague considered the results as against to the golden section hypothesis.

Most recently, McManus and his colleague (McManus et al. 2010) rejected the golden section hypothesis more clearly. They showed participants several pairs of rectangles with different ratios, including the golden section, and asked them to choose what they preferred. They also measured participants’ individual differences, such as personal traits and frequency of involvement into aesthetic activities by using some questionnaires, such as Big Five personality scales and “aesthetic activity” scales. They also assessed the relationships between those individual difference measures and preference for rectangles. The results showed that there are large differences in individual preferences for rectangles, and few participants preferred the golden section. Moreover, although as population preference, two factors indicating the preference for squares and rectangles were found, the preference for rectangles showed that more extreme rectangles than the golden rectangles (i.e., thinner rectangles) were most preferred. In addition, they found no correlation between the individual difference in personality traits or frequency of involvement into aesthetic activities and the variety in preference for rectangles, which means that they have not identified any factors that explain the individual difference in the preference, including the preference for the golden section yet. Thus they concluded that they could find no support for the preference for the golden section.

Second, the paper reviews a line of experiments using “method of production” of Fechner, which requires participants to produce pleasing objects (e.g., segmenting lines, making rectangles, sketching some stimuli, etc.). For example, Macrosson and Strachan (1997) experimented with lines as stimuli. They performed the experiment with product designers and undergraduate students of psychology. Participants were given booklets of eight sheets. On each paper, a line was drawn in different directions: horizontal, vertical, 45°, 135°, and participants were instructed to divide each line to form the most pleasing proportion in line segments. The frequency distribution of line partitioning for all orientations showed that product designers most often chose the proportion of 1:1 and 1:2, and that psychology undergraduates chose 1:1. Thus the preference for the golden section cannot be found.

However, Koneční (2003) provided positive evidence for the preference for the golden section, although, in limited conditions, and argued that the golden section plays an important role in art. He asked professional painters to sketch four types of stimuli as follows: (1) photographs, in which cutouts of vase with the golden section or 1:2 in the ratio of their width to height, were placed in different positions (making different line bisection including the golden section and other ratios) on top of a mantelpiece, (2) paintings by Kodama (the golden section and other proportions were used in his paintings both intentionally and unintentionally), (3) Mondrian (the golden section and other proportions were used unintentionally), and (4) Whistler (the golden section and other proportions were used unintentionally), and assessed the accuracy with which painters reproduced proportions in stimuli. In the condition of sketching photographs of vase, percentage of accurately reproducing the golden section was not higher than those of other proportions. In the condition of Kodama’s paintings, the golden section was reproduced accurately more often than all the proportions other than 1:1. In the condition of Mondrian and Whistler, the percentage of accurate reproduction of the golden section was significantly higher than those of other proportions. Koneční, thereby, argued that the use and detection of the golden section has significance in art and to artists, although they are elusive and subtle.

Di Dio and his colleagues (Di Dio et al. 2007) took a different approach of cognitive neuroscience, and suggested positive evidence for the preference for the golden section. Their question is whether objective feature of works of art, i.e., the golden section in this case, produces some specific pattern of neural activity. They presented images of classical and Renaissance sculpture to participants, and scanned their neural activity by using fMRI. They produced two kinds of stimuli, i.e., (1) canonical proportion, which were image of original sculpture, containing the golden section between body parts of statues, and (2) modified proportion, in which sculptures were modified to have longer trunk and shortened legs compared to original ones or modified in the opposite way, and presented them to participants under three conditions, i.e., (1) observation condition (participants were requested to observe images as if they were in a museum, and to answer whether they paid attention to the picture), (2) aesthetic judgment condition (they were requested to answer whether they liked the image), and (3) proportion judgment condition (they were requested to answer whether they found it proportional). According to the analyses of fMRI data, the observation of the canonical sculptures, contrasted to the modified sculptures, showed increased activation of the right insula. And under aesthetic judgment condition, when the images were judged as beautiful, the right amygdala was activated. Di Dio and colleagues concluded that the sense of beauty of naive participants includes distinct components, i.e., “objective beauty”, which is elicited by the objective feature such as the golden section and mediated by the activation of the insula, and “subjective
beauty”, which is accompanied with the activation of the amygdala and influenced by participants’ subjective emotional experiences.

**An Evaluation for the Present State**

This section summarizes recent studies on the golden section, and provides an evaluation for present state of the golden section hypothesis.

First, according to recent experiments using rectangles as stimuli and applying the method of choice, it seems that we do not have any preference for the golden section. Hekkert and his colleague (Hekkert et al. 1994) showed that participants without any art expertise preferred the golden section only if they were given instruction to choose subjectively pleasing stimuli. This result provided only weak support to the hypothesis. McManus and his colleague (McManus et al. 2010) showed that the rectangles other than the golden rectangles were most preferred. Therefore, the golden section hypothesis seems to be rejected as far as it concerns rectangles.

Second, a series of experiments employing the method of production showed more contradicting results. Macrosson and Strachan (1997), with their experiments that asked participants to divide a line in pleasing proportion, showed that both art-experienced (professional product designers) and naïve (psychology undergraduates) participants chose most often other proportions, including 1:1, rather than the golden section. On the contrary, Konečni (2003) asked professional painters to sketch photographs and paintings, and found that painters reproduced the golden section in the paintings more accurately than other proportions. Thus, the studies using the method of production shows some disagreement on the status of the golden section hypothesis.

Finally, we examine the study of cognitive neuroscience concerning biological basis of the preference for the golden section. Di Dio and his colleagues (Di Dio et al. 2007) measured neural activity of participants without any art expertise under two conditions, i.e., in one condition, they were presented with the original images of masterpieces of sculptures that had the golden section between parts of body, and in another condition, different versions of images that were modified in their proportion of bodily parts were presented. As a result, they found selective activity in the right insula in response to the golden section, whereas aesthetic judgment, in which images were judged as beautiful, activated the right amygdala. Therefore, they found a specific brain region, which selectively reacts to the golden section. This result suggests that there are some biological basis to detect the golden section, and accordingly some preference for the golden section. This could be regarded as a support for the golden section hypothesis.

As described so far, the results of various experiments contradict each other. Each approaches to the golden section, i.e., choice of rectangles, production of objects, and neuroaesthetic approach, have not found any conclusive data. As a result, it seems that the researchers have not reached agreement on the status of the golden section hypothesis. The hypothesis has not yet been either confirmed or rejected.

**Possible Causes of Disagreement in Recent Studies**

This section identifies some methodological and theoretical problems, which may cause disagreement on status of the golden section hypothesis, i.e., (1) the difference of stimuli, (2) the difference of method of experiment, or the kinds of tasks presented to participants, and (3) the participants’ level of art and design expertise.

First, it can be pointed out that types of stimuli presented to participants were different across experiments. For example, both Konečni (2003) and Di Dio et al. (2007) used works of art (for details, photographs and paintings, and images of sculptures, respectively) as stimuli and they reached positive results for the preference of the golden section, whereas other researchers used abstract figures such as rectangles and lines, and got negative results. Since Fechner, although rectangles and lines has been traditionally used in experiments testing the golden section hypothesis and different kinds of abstract figures have been introduced as stimuli, the effect of difference between abstract stimuli and realistic stimuli have never been seriously examined. It is possible that the preference for the golden section might be captured only by experiments using realistic stimuli.

Second, similarly as the first problem, it can be said that the kind of tasks that participants are requested to perform are different across experiments. For example, Konečni (2003) asked participants to sketch stimuli photographs and paintings, and found that participants reproduced the golden section more accurately compared to other proportions, whereas Hekkert et al. (1994) and McManus et al. (2010) requested participants to choose preferred rectangles from pairs, and failed to find the preference for rectangles with the golden section. Here, it may be said that positive results for the golden section were found only by tasks in which participants were made to produce some objects by their own hands, not by tasks just to choose some of given stimuli.

In addition to that tasks employed in the experiments are different in types, it is not clear what is actually measured by each different tasks. For instance, even if there are some neuroscientific or biological basis for the golden section and participants often divide lines with the golden section, this might be not due to our aesthetic preferences such as pleasing or liking but due to more practical judgments such as easy to detect or easy to produce.

Finally, it is pointed out that the participants’ expertise of art and design was defined differently in each experiment, and thus, was not controlled well across studies. Konečni (2003) recruited professional painters as participants with art expertise. Hekkert and colleague (Hekkert et al 1994), although they provided negative results for the preference of the golden section in general, they showed that only
participants without art expertise preferred the golden section. However, they operationally defined students of art school as participant with expertise of arts, and students without education of visual arts as naive participants. McManus et al. (2010) also seemed to have interest in influence of art expertise on the preference for the golden section. However, they only measured participants’ frequency of activity related to arts by questionnaire, and they failed to find any relation between frequency of art activity and the preference of the golden section. Macrosom and Strachan (1997) defined professional product designers as participants with art expertise and undergraduates of psychology as participant without art expertise, and they could find no positive evidence for preference of the golden section. Thus, expertise of art was defined in various ways in each experiment, which might end in contradicting results of experiments.

Evaluating recent studies revealed that even after Green’s review, experimental conditions such as types of stimuli and kinds of tasks presented to participants have been differently setup in each study, and some factors that could have an effect on preference, such as participants’ expertise in art, have not been adequately controlled. And therefore, it can be said that comprehensive experiment, which manages such conditions and factors carefully, have never been conducted.

**A Prescription**

This section proposes some solutions to problems described in the previous section. First, this paper proposes to improve measurement scales, which measures participants’ expertise of art. In the most experiments, expertise of art is controlled by sampling two groups of participants, i.e., undergraduates of psychology and students of art school (or professional artists). Of course, some scales concerning art expertise have been already developed. For example, as already introduced in the former section, McManus and colleagues (McManus and Furnham 2006; McManus et al. 2010) developed “aesthetic activity” scales, which measures the frequency of involvement into activity related to arts (e.g., listening to music, going to museum, drawing or painting, going to the theaters, and etc.). Similarly, Smith and Smith (2006) developed “Aesthetic Fluency” scale, which measures the degree to which participants know about artists and concepts in the history of art. However, various experiments use different scales or different samples to control expertise of art, and which accordingly resulted in disagreement regarding to status of the golden section hypothesis. Common scales should be developed and used across different experiments. At least, it is necessary to develop scales, which enables to discern the difference among people who sometimes goes to museum, students of art school, and professional painters.

Second, on the basis of improvement of measurement scales mentioned as the first point, it is proposed that crucial experiments should be designed and conducted. As mentioned in the previous section, experimental conditions such as types of stimuli and kinds of tasks presented to participants have been differently setup in each study, and some factors that could have an effect on preference, such as participants’ expertise in art, have not been adequately controlled, which made it difficult to compare the results of different experiments, and accordingly caused disagreement in conclusion based on results of experiments. It is necessary to manage such conditions and factors comprehensively, and conduct crucial experiments to decide the status of the hypothesis. For example, the effect of difference in types of stimuli or kinds of tasks should be tested seriously. Experiments based on choice of rectangles (e.g., McManus 2010) also should be replicated with professional painters as participants.

**Conclusion**

Reviewing relatively recent experiments related to the golden section hypothesis since 1990s revealed that the results of various experiments still contradict each other, each approaches to the golden section, i.e., choice of rectangles, production of objects, and neuroaesthetic approach, have not had any conclusive data yet, and accordingly, the researchers have not reached agreement on the status of the hypothesis. As possible causes of the disagreement, the following problems were mentioned: (1) the difference in types of stimuli, (2) the difference in the kinds of tasks presented to participants, and (3) the participants’ level of art and design expertise. Finally, it was proposed that measurement scales for participants’ expertise of art should be improved, and that crucial experiments, which could manage experimental conditions and other factors, should be designed and conducted to decide the status of the hypothesis.

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**References**


Do Observers Like Curvature Or Do They Dislike Angularity?

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Abstract
Humans prefer curvy objects. Four experiments clarified whether curvature is liked or whether angularity is disliked, or both. In Experiment 1 a preference for curved shapes over angular ones was confirmed, but not a link with perceived complexity. Experiment 2 and 3 examined preference for curved lines as compared to straight lines that have no angles. When the lines presented several orientations, the curved ones were liked more than either angular or straight lines. Finally, the manikin task in Experiment 4 showed a pattern of approach for curved shapes rather than a pattern of avoidance for angular ones. In sum, the curvature effect is not a by-product of a dislike for angularity, but curved shapes are, per se, visually pleasant.

Keywords: aesthetics; visual preference; curvature; complexity.

Introduction
What Might Make Curvature Attractive?
Curvature has been used across cultures and the arts as well as geographical locations, from prehistoric times to nowadays. William Hogarth (1697-1764) in his "Analysis of Beauty" stated: “For as among the vast variety of waving lines that may be conceived, there is but one that truly deserves the name of the line of beauty, so there is only one precise serpentine-line that I call the line of grace”.

Experimental studies on the perception gave us the Gestalt principles, including the principle of good continuation (Kanizsa, 1979). A curve is a case of good continuation because it is a set of related points. Sensitivity in a contour detection task increases when elements are collinear (Field, Hayes, & Hess, 1993) or snakes (similar local orientation) as opposite to ladders (orthogonal local orientation) (Bex, Simmers & Dakin, 2001). If the integration of smooth contours is easier then this advantage may occur for curved as opposed to angular contours in visual preference studies. A link between sensitivity and preference is similar in principle, but also different from the idea of fluency (observers prefer what is easier to be processed; Reber, Schwartz, & Winkielman, 2004). Fluency may relate more to perceived complexity and a direct link between curvature and perceived complexity so far was not confirmed (Phillips, Norman, & Beers, 2010, Silvia & Barona, 2009; Friedenberg & Bertamini, 2014)). In addition to visual factors, the underlying emotional or associative properties of the shapes might play a role (i.e. "takete/maluma" phenomenon; Wolfgang Köhler, 1947) in preference formation. For example, Lundholm (1921) and Poffenberger and Barrows (1924) found that angular stimuli were associated with terms such as agitating, hard, and furious, and that curved stimuli were associated with gentle, sad, quiet, and lazy.

Do Angles Signal a Threat? Reasons in Favor and Against a Dislike to Angularity.
There is not a clear theoretical explanation for a preference for curvature, therefore could it be that the phenomenon is mainly an angularity effect? Bar and Neta (2006; 2007) suggested that the preference for curvature originates from a dislike for angular objects because they are perceived as signalling a thereat. They found some neuropsychological evidence in support of this proposition (Bar & Neta 2007). Larson, Aronoff, Sarinopoulos, & Zhu (2009) showed that the downward-pointing V shapes activated the neural networks for threat detection, including the amygdala. However, when angles become sharper the preference should monotonically decrease because sharper objects are more dangerous. However, such a modulation has not been reported so far.

The Current Study
In four experiments we investigated whether the threat hypothesis plays the key role in explaining the preference for curved shapes or whether there are intrinsic properties that make curved shapes more pleasant than angular shapes. In
other words whether there is a positive response to curvature not mediated by angularity.

**Experiment 1**

In Experiment 1 we tested preference for abstract shapes. Similarly to Silvia and Barona (2009) participants rated both preference and subjective complexity.

**Participants.** Twenty participants took part in Experiment 1 (age range: 18 – 23; 15 females). All the experiments reported here were approved by the Ethics Committee of the University of Liverpool and conducted in accordance with the Declaration of Helsinki (2008).

**Stimuli and Experimental Design.** Stimuli consisted of irregular polygons with a black contour (Figure 1) generated by three articulations (see top row in Figure 1). To make curved stimuli the polygons in one condition were interpolated with a cubic spline. The design was a 2 x 3 x 2 x 2 with factors: Shape (angular vs. curved); Articulation (cassini0 vs. cassini70 vs. cassini90); Orientation (0, 45 and -45 degree) and Vertex (22 vs. 26). The experiment consisted of 180 trials. Each trial started with a fixation cross, then the shape appeared and remained on screen until response. Participants rated preference on a visual scale ranging from ‘dislike’ (0) to ‘like’ (100), and complexity from ‘not complex’ (0) to ‘complex’ (100). The two tasks were performed in blocks counterbalanced across participants (Figure 1).

**Results.** The results are illustrated in Figure 2. A 2x3x3x2 repeated measures ANOVA on preference revealed a main effect of Shape (F = (1, 19) = 14.96, p = .001, \eta_p^2 = .441); the curved shapes were preferred over the angular ones (curved: M = 50.12, SD = 2.46; angular: M = 37.48, SD = 2.79). The analyses on complexity confirmed a main effect of Shape (F = (1, 19) = 8.76, p = .008, \eta_p^2 = .316); the angular shapes were rated as more complex (M = 46.56; SD = 2.95) than the curved ones (M = 40.48; SD = 3.29). Main effects of Articulation and Vertex were also significant (Shape: F = (2, 38) = 5.53, p = .008, \eta_p^2 = .225 and Vertex: F = (1, 19) = 121.08, p = .000, \eta_p^2 = .864). Finally, the interaction of Shape x Articulation was significant: F = (2, 38) = 3.81, p = .031, \eta_p^2 = .167. The correlations between responses in the preference and complexity tasks was not significant (r(19) = -.425, p = .676).

**Discussion.** Experiment 1 confirmed a preference for curvature. With respect to complexity, angular shapes were judged as more complex than curved ones. However, in line with Silvia and Barona (2009) there was no link between which shapes were preferred and which shapes were judged more complex.

**Experiments 2 and 3**

It is important to test curved lines against not just angular lines but also straight lines. This allows us to see if preference for curvature survives a comparison with stimuli that have no curvature but have no corners either (straight lines). Moreover, the comparison between straight lines and angular lines tests the role of angles in visual preference.

**Participants.** Fourteen observers took part in Experiment 2 (age range: 18 – 31; 10 females) and Fourteen in Experiment 3 (age range: 17 – 44; 8 females).

**Stimuli and Experimental Design.** Each stimulus consisted of a pattern of seven lines. There were three types of patterns: straight, angular, and curved. The lines were seen within an aperture (Figure 3). The only difference in the stimuli is that in Experiment 2 the lines did not cross (Figure 3, panel A), while in Experiment 3 the patterns were possibly more appealing showing criss-cross lines (see Figure 3, panel B). The experimental design and procedure were identical for both experiments. A 3x2x2 within-subjects design was employed with factors: Line (angular vs. curved vs. straight); Aperture (squared vs. circle); and Colour (set 1 vs. set 2). Each experiment consisted of 120 trials. Each trial started with a fixation cross, then the pattern appeared and remained on screen until response. Participants rated preference for each pattern on a visual scale similar to the one used in Experiment 1 (from 0 = dislike to 100 = like).

**Results.** The results of Experiment 2 are shown in Figure 4 (panel A). A 3x2x2 repeated measures ANOVA on preference confirmed a main effect of Line (F(2,53) = 6.50, p=.000 \eta_p^2 =.612). The patterns with curved lines (M = 62.83; SD = 2.00) were not preferred over the patterns with straight lines (M = 61.09; SD = 3.90), as confirmed by a paired samples t test (t(13) = -3.13, p = .008). The patterns with curved lines (M = 60.45; SD = 2.34) were preferred over those with angular lines (M = 35.95; SD = 3.46), t(13) = 5.77, p = .000. There were no other effects in Experiment 2. The results of Experiment 3 are illustrated in Figure 4 (panel B). A 3x2x2 repeated measures ANOVA on preference confirmed a main effect of Line (F(2,26) = 6.50, p=.005 \eta_p^2 =.333). Curved lines (M = 64.45; SD = 2.34) were preferred over the patterns with straight lines (M = 51.79; SD = 3.94), as confirmed by a paired samples t test (t(13) = -3.13, p = .008). Importantly, there was no significant difference on preference for patterns with angular lines vs. those with straight lines (t(13)= 1.70, p = .114). There was also a main effect of Colour (F(1, 13) = 6.64, p=.023 \eta_p^2 =.338): participants found Set colour 1 (M = 53.70; SD = 2.65) more attractive than Set colour 2 (M = 50.05; SD = 2.94).

**Discussion.** Experiments 2 and 3 revealed that curvature is preferred over angularity even when it does not form a closed shape. Therefore, a preference for curvature is present for simple elements such as lines. The most important result comes from Experiment 3 where the presence of angles was not a key factor in generating a difference in preference. The stimuli with angles were disliked as much as those with
straight lines and no angles. Therefore, this result is consistent with the hypothesis that curves have a pleasant appearance, which is not only a consequence of their lack of angularity. The reason why this pattern of results did not occurred in Experiments 2 might be to a lack of variability in the orientation of the lines.

**Experiment 4**

In Experiment 4 we adopted the manikin task (De Houwer, Crombez, Baeyens, & Hermans, 2001; Krieglmeyer, & Deutsch, 2010) as an implicit measure to examine avoidance and approach reactions to angular and curved shapes. In the manikin participants press the arrow keys to move a figure of a person (the manikin) away or towards the stimulus. Therefore, in Experiment 4 we tested the threat hypothesis: response times for angular shapes should be faster when avoiding these shapes as compared to when approaching them. The hypothesis that people like curvature predicts faster reactions when approaching these shapes as compared to when avoiding them.

**Participants.** Thirty-six participants took part in Experiment 4 (age range: 18 – 31; 27 females).

**Stimuli and Procedure.** Stimuli consisted of irregular abstract shapes with 22 vertices starting from the cassini0 function in Experiment 1. The manikin consisted of a circle for the head, and straight lines for the body as well as for the limbs (about 2.5 cm high and 1 cm wide). A trial started with a fixation cross. Participants were instructed to press key ‘5’ on the numeric pad to let the manikin appear on screen. The manikin could appear either on the bottom or on the top of the screen. After 750 ms a shape (angular or curved) was presented at the centre of the screen. Participants moved the manikin as quickly as possible and as accurately as possible by pressing key ‘8’ (upward) or key ‘2’ (downward). Depending on the position (bottom or top of the screen) and the movement direction (upward or downward), the figure stopped after three key presses either at the edge of the screen or close to the shape (see Figure 5). The screen turned black 50 ms after the third key press. The dependent variable was the time between the onset of the manikin and the last key press. Participants completed one compatible block of 60 trials and one incompatible block of 60 trials. The order of compatible and incompatible blocks was counterbalanced across participants.

**Results.** The results are illustrated in Figure 6. A 2X2 repeated measures ANOVA on RTs showed a main effect of Condition (F(1, 28) = 10.69 , p=.003 η_p^2 =.276): participants were faster in the compatible (M = 1.11; SD = .057) than in the incompatible trials (M = 1.27; SD = .088). The main effect of Shape (F(2, 38) = 3.23, p=.051 η_p^2 =.145) was also statistically significant, meaning that participants overall performed faster with angular shapes (M = 1.14; SD = .063) rather than with curved ones (M = 1.25; SD = .079). Importantly, the interaction effect of Condition by Shape was statistically significant (F(1, 28) = 18.22, p=.000 η_p^2 =.394). For angular stimuli, RTs did not differ between compatible and incompatible trials (t(28) = -1.68, p = .104). This means that participants did not move the manikin away from the angular shapes faster (M = 1.14; SD = .24) than towards them (M = 1.21; SD = .37). In contrast, for curved stimuli RTs differed between compatible and incompatible trials (t(28) = -3.93, p = .001). Participants were faster to move the manikin closer to the curved shapes (M = 1.16; SD = .29) than away from them (M = 1.41; SD = .52).

A similar pattern of results was found for the error rates (Figure 6, panel B). The number of errors for the angular stimuli did not differ between compatible and incompatible trials (t(35) = .192, p = .849). In contrast participants made more errors when moving the manikin away from the curved shapes than towards them (t(35) = -3.19, p = .003).

**Discussion.** Experiment 4 tested whether angular shapes are implicitly associated with threat, and therefore generate an avoidance reaction. The predicted advantage for the angular shapes in the compatible trials of the manikin task (De Houwer et al., 2001) was not confirmed: the response latency for the angular shapes did not differ across conditions. Therefore, angular shapes are not necessarily associated with threat. Overall participants responded faster to the angular shape in both conditions, possibly because they are more arousing, as in the corner enhancement effect (Cole, Skarratt, & Gellaltly, 2007). Interestingly, we found that moving the manikin away from curved shapes was slower than moving it towards them, and there were also significantly more errors in this condition, which can be seen as a preference to move towards curvature. In conclusion, Experiment 4 did not confirm an avoidance response for angularity but showed an approach response for curvature. This finding weakens the hypothesis that preference for curved shapes derives from a dislike for angular shapes (Bar & Neta, 2007). Finally, Experiment 4 supports a preference for curved shapes based on their aesthetic properties.

**General Discussion**

Most people prefer curved objects to angular ones, however the source of such a preference is under debate. The current set of experiments clarified whether smoothly curved contours are preferred because of their structure, or indirectly because they are not angular. The preference effect for curvature occurred in all the experiments presented here.

Experiment 1 clarified that such a preference is not directly linked to complexity, thus confirming similar findings (Silvia and Barona, 2009). Experiment 2 and 3 showed a curvature effect for lines presented through an aperture. To our knowledge, this was the first experimental attempt to test preference for curves per se. Experiment 3 showed that angles did not play the major role in generating a difference in preference scores, although interpretation of Experiment 2 is more difficult. Finally, the manikin task in Experiment 4 failed to support an avoidance reaction for
angular shapes. This is not consistent with the “threatening” explanation for angular shapes (Bar and Neta, 2006; 2009).

In conclusion our data suggest that the preference for curvature is not a by-product of a negative response to angularity. The curvature effect is likely to be caused by intrinsic characteristics of the stimuli, rather than what they might signal. Curved shapes can be described as cases of good continuation (Wagemans et al., 2012) and perhaps they are good Gestalt. Therefore, one possibility is that curvature enhances contour sensitivity although this was not measured in our studies. Further studies should address the way in which grouping phenomena relate to preference for curvature.

Acknowledgments
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References

Figures

Figure 1. Methodology of Experiment 1: Illustration of the stimuli (Top panel). Stimuli and experiment were created using python and Psychopy (Peirce, 2007). Top row: three original articulations (from a Cassini function). Middle row: shapes with angular contour. Bottom row: shapes with curved contour. Illustration of the tasks (Bottom panel). The Figure shows the response screen for (A) Preference rating and (B) Complexity rating. Participants sat at approximately 60cm of distance from the screen. Stimuli were presented on a 1280 X 1024 Apple StudioDisplay 21" Cathode Ray Tube (CRT) monitor at 60Hz.
Figure 2. Results of Experiment 1. (A) Preference rating as a function of Articulation (cassini0 vs. cassini70 vs. cassini90) and Shape (angular vs. curved; separate lines). (B) Complexity rating as a function of Articulation (cassini0 vs. cassini70 vs. cassini90) and shape (angular vs. curved; separate lines). (C) Preference rating as a function of Vertex (22 vs. 26) and Shape (angular vs. curved; separate lines). (D) Complexity rating as a function of Vertex (22 vs. 26) and shape (angular vs. curved; separate lines). Error bars are SE of the mean.

Figure 3. Illustration of the stimuli for Experiment 2 (A) and Experiment 3 (B). The top panel shows the pattern with angular, curved and straight lines, with the square aperture and with Set colour 1. The bottom panel shows the pattern with angular, curved and straight lines, with the circular aperture and with Set colour 2. All the patterns were generated with circle and square apertures and with both sets of colours. Participants sat at approximately 60cm of distance from the screen. Stimuli were presented on a 1280 X 1024 DELL M993s 19" Cathode Ray Tube (CRT) monitor at 60Hz.

Figure 4. Results of Experiment 2 (A) and Experiment 3 (B). Participants’ preference rating (y axis) as a function of Aperture (square vs. circle; x axis) and Shape (angular vs. curved vs. straight; separate bars).

Figure 5. Experiment 4: Illustration of the design. The left panel shows the compatible task: the manikin was moved by the participant away from an angular shape (top) or towards a curved shape (bottom). The right panel shows the incompatible task: the manikin was moved by the participant towards an angular shape (top) and away from a curved shape (bottom). In this figure the manikin is shown always underneath the stimulus, but it was presented above the stimulus with equal probability. Participants sat at approximately 60cm of distance from the screen. Stimuli
were presented on a 1280 X 1024 Apple StudioDisplay 21" Cathode Ray Tube (CRT) monitor at 60Hz.

Figure 6. Results of Experiment 4. (A) Participants’ RTs (y axis) as a function of Condition (compatible vs. incompatible; x axis) and Shape (angular vs. curved; separate bars). (B) Participants’ error rates (y axis) Condition (compatible vs. incompatible; x axis) and Shape (angular vs. curved; separate bars). Error bars are SE of the mean.
Category-Specific Encoding of Face and Place Attractiveness in the Brain

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Abstract

Previous studies have identified regions in human prefrontal cortex whose neural response correlates with the beauty of perceived stimuli. We sought to determine whether some of these beauty-related responses were category-specific. Subjects were scanned with functional magnetic resonance imaging (fMRI) while making attractiveness ratings of faces and places. Ventromedial prefrontal cortex (vmPFC) responded to both face and place attractiveness, but there were distinct patterns of response in a ventral subregion for each. Activity in lateral orbitofrontal cortex (latOFC), on the other hand, was only sensitive to face attractiveness. These results go beyond previous findings indicating prefrontal response to beauty across a variety of stimulus categories by showing that there is some category-specific attractiveness response in vmPFC and latOFC.

Keywords: neuroaesthetics; faces; places; attractiveness; fMRI; ventromedial prefrontal cortex; orbitofrontal cortex.

Introduction

Beauty is a concept that people apply to a wide range of experiences and objects in the world. The fact that a common label unites such a variety of aesthetic evaluations raises the hypothesis that the underlying evaluative process for objects and experiences is similar. In support of this hypothesis, some studies in the neuroaesthetics literature have shown that a reward-related region of the brain, the ventromedial prefrontal cortex (vmPFC), responds more strongly for beautiful stimuli than ugly stimuli, regardless of the stimulus type or modality (Ishizu and Zeki 2011; Brown et al. 2011; Ishizu and Zeki 2013).

Beyond the possibility of commonalities across aesthetic evaluations, there are also obvious differences. For example, the rewards associated with beauty are distinct for different stimulus categories: beautiful faces offer the promise of reproductive success and social advancement (see Rhodes 2006 for a review), whereas beautiful landscapes offer the promise of prospect/refuge, physical resources, and rest (Appleton 1975; White et al. 2010; Berman & Kaplan 2008). But despite these differences, there is little neural evidence that category-specific aesthetic information is retained in reward-related brain regions.

To examine the question of whether or not frontal cortex responds to category-specific aesthetic information, we measured neural activity in the ventromedial prefrontal cortex (vmPFC) and lateral orbitofrontal cortex (latOFC) while subjects in an fMRI scanner rated the visual attractiveness of face and place images. We investigated regions where activity was correlated with face or place attractiveness to determine 1) if there were differences in mean levels of attractiveness-related response to the two categories of stimuli 2) if the voxel-by-voxel activity patterns within each region differed between the two categories of stimuli.

Methods

Procedure

144 color images of outdoor nature scenes and 144 male/female faces were collected from databases and online resources. Place images portrayed environments such as beaches, forests, fields, mountain ranges, and deserts. All faces were cropped from their own backgrounds, set on a uniform background, and were forward facing with neutral to pleasant expressions. 10 pilot subjects made 1-8 Likert scale ratings on a larger set of places and faces (subjects rated all faces and then all places, or vice versa). These ratings were then z-scored across categories, and used to select the 144 faces (72 female) and 144 scenes that similarly spanned a range from “very unattractive” to “very attractive.”

In the scanner, 28 subjects made simple attractiveness judgments of the selected face and place images (“very unattractive”, “mediocre/average”, “very attractive”). Images were presented in sets of 12 and blocked by category, such that in each of the 6 scan runs, subjects rated 2 blocks of faces and 2 blocks of places (Figure 1). Every image was presented for 1 second with a 2 second interstimulus interval,
and subjects were allowed to make their ratings anytime within the span of those 3 seconds. After the scan, subjects made 1-8 Likert scale ratings on all of the images. These post-scan ratings were used in our subsequent fMRI analysis rather than the coarser in-scan ratings, because they provided a finer-grained measure of attractiveness when looking for correlated brain activity.

![Figure 1. Stimuli and blocked design for fMRI task](image)

**Data Analysis**

We used general linear modeling (GLM) to estimate neural activity correlated with subject-specific ratings of face and place attractiveness. For each subject, we included in the model parametric regressors for subject-specific face and place attractiveness ratings and reaction times, as well as regressors that indicated trial type (face or place) and other regressors of no interest.

In our first set of analyses, we tested to see if regions that showed a significant mean response to face attractiveness also showed a similar response to place attractiveness, and vice versa. We began by locating regions within frontal cortex that showed a significant response to attractiveness for at least one category. To do this, we first registered each subjects’ voxel-wise parameter estimates from the GLM to the cortical surface of a group-average brain so that we could compare activity across subjects. We then performed a random-effects analysis across subjects for the two contrasts of interest (face attractiveness and place attractiveness). We restricted our search to clusters of activity within the latOFC and vmPFC, and we ran a permutation test to set a p-value that was corrected for multiple comparisons within those regions. For those clusters that did show a statistically significant response to either face or place attractiveness, we then tested whether there was an overall difference in the mean level of response between face and place attractiveness. To obtain unbiased estimates for these values, we defined the clusters for each subject individually by using an analysis that replicated the procedure described above, but which excluded that specific subject. We then extracted mean parameter estimates from within those clusters for the left-out subject. By iterating this analysis across all subjects, we estimated the response in each cluster to face and place attractiveness using independent data sets to define the boundary of the cluster and the strength of the effect. We then used a repeated-measures t-test to compare across subjects the response in each cluster for face and place attractiveness.

In our second set of analyses, we took clusters that showed similar mean levels of response to face and place attractiveness and tested whether the distributed patterns of response to face and place attractiveness contained category-specific information. To do this, we first split each subjects’ data into independent halves: each half consisted of parameter estimates derived from only 3 of the 6 runs. In other words, for every point on the brain we obtained two values for both contrasts of interest, each an estimate derived from only one half of the data. By then correlating these estimates across halves of the data using all of the points in a given cluster, we were able to derive both a within-category and across-category similarity score. Successful “classification” occurred if the similarity score between the face attractiveness patterns (or place attractiveness patterns) in opposite halves of the data (within-category comparison) was greater than the correlation between face and place attractiveness patterns in opposite halves of the data (cross-category comparison).

**Results**

**Behavioral Analyses**

Within-scan ratings of face and place attractiveness were strongly correlated with post-scan ratings (Pearson’s r averaged across subjects for faces = 0.74, t(27)=45.04, p<0.0001 and for places = 0.71, t(27)=35.17, p<0.0001; p-values reflect repeated-measures t-tests on correlation scores). The high degree of correlation provided validity to the use of post-scan ratings in our subsequent fMRI analyses.

Figure 2 shows reaction time (RT) plotted as a function of attractiveness. Rather than a linear function, RT exhibited an inverted-U shaped relationship with both face and place attractiveness, peaking in the center range. RTs for face judgments were highly symmetrical around the mean, and were not correlated with face attractiveness ratings (Pearson’s r for in-scan response times and face att.= -0.01), whereas RTs for place judgments were asymmetrical and therefore more highly correlated (r=-0.24).

![Figure 2. Response time as a function of attractiveness.](image)
Mean Response to Face and Place Attractiveness

In our first set of fMRI analyses, we asked whether or not regions that responded to the attractiveness of one stimulus category also responded similarly to the attractiveness of the other stimulus category.

In right lateral orbitofrontal cortex (latOFC), we observed a significant cluster of activity for face attractiveness (Figure found at end of document). This cluster did not show a significant response to place attractiveness (t-test, t(25)=0.46, p=0.65), and a direct comparison between the two categories confirmed a significantly greater response to face attractiveness than to place attractiveness (t(25)=2.64, p=0.01).

In bilateral ventromedial prefrontal cortex (vmPFC), we observed significant clusters of activity for both face and place attractiveness (Figure at end of document). All 4 of these vmPFC clusters showed a significant response to both face and place attractiveness, irrespective of how they were initially identified (LvmPFC-place response to face att. t(27)=2.11, p=0.04, response to place att. t(27)=4.09, p=0.0004; LvmPFC-face response to face att. t(27)=4.19, p=0.0003, response to place att. t(27)=3.70, p=0.001; RvmPFC-place response to face att. t(27)=3.36, p=0.002, response to place att. t(27)=3.60, p=0.001; RvmPFC-face response to face att. t(27)=4.17, p=0.0003, response to place att. t(27)=2.18, p=0.04; statistics obtained by t-tests comparing extracted mean parameter estimates against zero). Importantly, for all 4 vmPFC clusters, there was no difference in response between face attractiveness and place attractiveness (LvmPFC-face t(27)=0.09, p=0.93, RvmPFC-face t(27)=1.04, p=0.30, LvmPFC-place t(27)=−1.39, p=0.18, RvmPFC-place t(27)=−0.34, p=0.73, all n.s., see Figure at end of document; all statistics were obtained by repeated-measures t-tests comparing extracted mean parameter estimates across categories.)

Pattern Response to Face and Place Attractiveness

In our second set of fMRI analyses, we asked whether or not the distributed patterns of response to face and place attractiveness were distinguishable in any regions that showed a significant mean response to both categories. By measuring the similarity of distributed patterns of response within and across face and place attractiveness, we could test for the presence of intermixed but functionally distinct populations of neurons within a given region.

Classification accuracy for a right hemisphere cluster (RvmPFC-place) was above chance (accuracy = 58%, t(27)=2.63, p=0.014), meaning that patterns within the same stimulus category were more similar than patterns across stimulus categories. The other right hemisphere cluster showed near-significant classification (RvmPFC-face accuracy = 55.8%, t(27)=−1.9, p=0.068), likely because it overlapped with the cluster that had a classification accuracy above chance. Neither left hemisphere cluster showed significant classification (LvmPFC-place accuracy = 50.3%, t(27)=−0.1, p=0.92; LvmPFC-face accuracy = 46.1%, t(27)=−1.33, p=0.20).

Discussion

Previous findings in the neuroaesthetics literature have suggested that the vmPFC responds to beauty, regardless of the stimulus type. Our results parallel those findings by showing a common response in vmPFC to both face and place attractiveness, but we also extend those findings by showing that some category-specific information is retained in vmPFC. Furthermore, a region of latOFC also showed category-specificity by selectively responding to face attractiveness and not place attractiveness.

Our results in vmPFC reveal that this region contains category-general as well as category-specific information related to aesthetic value: while multiple clusters in vmPFC showed the same overall level of response to the attractiveness of both faces and places, one ventral cluster contained distinct patterns of response to the attractiveness of these two categories. This evidence suggests that the population of neurons that respond to face attractiveness and the population of neurons that respond to place attractiveness may be somewhat distinct but intermixed within vmPFC. Such a situation would explain why studies that have only tested for mean response to aesthetic value have not observed differences in response between categories. While this method is not often applied to studies of frontal cortex, a recent study in the neuroeconomics literature reinforces our own results: pattern analysis was used to demonstrate category-specific information for food and trinket value in vmPFC (McNamee, Rangel, and O’Doherty, 2013).

In latOFC, we observed a response to face attractiveness but not place attractiveness, suggesting that the orbital surface may contain at least one distinct cortical region that responds selectively to only certain kinds of attractiveness. These results reinforce and extend the single-category studies of face and place beauty: two studies did show positively correlated activity in latOFC with face attractiveness (Winston et. al 2007; Tsukiu & Cabeza 2011), while one study showed no beauty-related response to indoor images in latOFC (Vartanian et al. 2013).

In conclusion, our results add to the growing literature on the neural correlates of aesthetic evaluations by revealing neural correlates of category-specific aesthetic information in frontal cortex. We expect that further research will continue to illuminate our understanding of the neural mechanisms that underlie our experiences of beauty.

References


Figure. Clusters showing a significant response to face attractiveness (blue) or place attractiveness (green). Bar graphs show mean parameter estimates for face and place attractiveness within these clusters. All vmPFC clusters show significant response to both face and place attractiveness. The cluster in right latOFc only shows a significant response to face attractiveness.
Understand *After* Like, Viewer’s Delight: A fNIRS Study of Order Effect in Combined Hedonic and Cognitive Appraisal of Art

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**Abstract**

Thirty-two subjects evaluated paintings in a two-part task in which half first evaluated for understanding followed by liking and the other half had question order reversed. Brain activity was recorded via functional Near Infrared Spectroscopy. Artwork appraisal showed no judgment interrelation or order effect, with first appraisals having no impact on subsequent judgment. However, subjects who began first with evaluation for liking followed by understanding, and who came to incongruent combinations of assessments, showed higher activation in left medial prefrontal cortex, functionally associated with attention/self-related assessment and integration of hedonic and informational elements. Findings provide tentative support for a hedonic-driven order effect, raise important implications regarding biological connection between liking/understanding and suggest need for further such consideration in appraisal-related research.

**Keywords:** art appraisal; hedonic and cognitive processing; combined judgments; Prefrontal Cortex (PFC).

Appraisal of our environment is a core topic for psychological study of human life. From classic philosophy, through the founding of experimental psychology (Fechner, 1876) and to the present day, some of the most persistent questions have remained how it is that we come to the conclusion that something is good or bad, personally rewarding or worth further involvement; not to mention how we process information or come to comprehend. Implications of these questions run a gamut of connections from social and personal relations to economics, consumer choice, to basic understanding of human perception and thought.

Even more intriguing, is the question of how our assessments combine. According to both classic and contemporary scholarship (see Belke et al., 2010), human decisions are almost never discrete. Rather daily life is composed of a series of heuristic conundrums—“It’s beautiful; I don’t know what it is”—where we do switch between decisions, assimilate assessments or change evaluations based on previous engagement. This is in turn specifically notable for two appraisals which are argued to represent the two main approaches to assessment itself: (1) so-called “hedonic” or “aesthetic” evaluation of an object’s relative merit, beauty or worth; and (2) “cognitive” or “pragmatic” understanding of mimetic or semantic content (Leder et al., 2006).

Because these modes—essentially deciding that we can understand and that we like—are argued to be fundamental building blocks for our relation to the environment, and are utilized in tandem in most tasks, their integration remains one of the most persistent topics in humanistic and psychological science. Longstanding questions remain: how does our understanding affect or influence our liking, or vice versa? Are these modes functionally or behaviorally distinct? How does our answer to one element impact subsequent decisions; is there a primacy or order effect? However despite history and pragmatic applications, an answer to the seemingly simple question of how liking and understanding do integrate is largely unresolved (Belke et al. 2010).

Interestingly, the area where this topic has both most been considered, and where a new approach might be found, is in the psychological considerations of art. Art-viewing, has been a favorite stimulus for evaluating combined judgments. Even more, because liking and understanding is argued to be required in order to successfully process art, it is also in art study where we find the bulk of discussion for these modes’ interrelation. This has in fact resulted in two main arguments.

The first represents a “classic” idea that these modes are functionally discrete (Belke et al., 2010; Cupchik et al., 2009; Kreplin & Fairclough, 2013). This stems from the conception—traced from Plato through the Kantian and analytic era—that judgments of understanding rely on attending to contextual aspects of a stimulus. This is argued to constitute a mode of appraisal which requires subjective interpretation of information as it pertains to one’s own personal or socio-cultural place. This is viewed as distinct from appraisals of beauty or hedonic quality. In the latter case, assessments are argued to be evoked by adopting a “detached,” non-cognitive assessment of formal elements. While because especially the hedonic assessment requires one to disengage from practical concerns/understanding, these would have no inter-effect.

On the other hand, a second theory suggests that these modes may correspond. In this theory (Belke et al., 2010 for review), the driving point for appraisals is the success or fluency with which we can process. Given a cognitive task, successful processing is argued “to provide an affectively positive and self-rewarding experience” (Belke et al., p. 2) which leads to liking or other positive assessments. Alternatively, to not have fluent interaction would indicate threat, and an individual would devalue a stimulus by labeling it as something one does not ‘like.’

**A New Suggestion for Liking-Understanding Integration from Processing of Art in the Brain?**

While these above approaches have been the basis for much important research and empirical evidence, most recently there has been one other argument which offers a compelling approach to liking/understanding interaction and which may put these theories on their head. This idea as well derives from discussion of art, however within the emerging area of
neuroaesthetics or art’s processing by the brain. This views art experience as a temporal sequence of neural functions and not only suggests that liking and cognitive understanding may characterize distinct mental processes occurring at different stages, it also argues that these two modes may be interconnected, key components of this processing sequence.

Originating from earlier cognitive discussion (Leder et al., 2004) and placed into a neural model by Chatterjee (2003; Nadal et al., 2008 for review), assessment is argued to begin with analysis of the global properties of a stimulus employing frontal-parietal attentional circuits and the ventral visual stream. This basic object recognition then engenders an initial hedonic response, presumably tied to assessments of personal relevance and/or approach/avoidance (see also Scherer, 2009). Based on this assessment, one is then encouraged or dissuaded from further involvement. In the case of the former where one is engaged, one may begin processing for more detail or context/understanding. “This further modulation,” Chatterjee (p. 55) concludes, “likely contributes to a more vivid experience,” both in attributes such as form as well as content. Thus, “a feedforward system is established,” between liking and understanding, “in which the attributes of an aesthetic object engage attention,” and attention “further enhances” processing of attributes.

This then raises a rather novel basis for considering the ordering and integration of hedonic/understanding assessments. While it is important to note that no such conclusions have yet been raised by the model authors themselves, if we do extend from this model’s argument for a general progression in the aspects whereby the brain processes art to the potential impact on our final assessment, this theory could suggest a potential hedonic-led order-effect. Namely, determining whether or not an object is hedonically pleasing may play an important role in priming the individual for further, deeper engagement. Functionally, this may be tied to higher interest or self-relevance engendered when one does process for hedonic or aesthetic aspects first. This may also fit an evolutionary explanation whereby individuals make a first check for relative importance or threat (Scherer, 2009). Accordingly, as put by Cela-Conde et al. (2011), initial hedonic appraisal, by evoking internally-generated interest, may therefore “be crucial” for an individual to arrive at the engaging or rewarding experience described in the latter model stages. This argument can also be found in the earlier idea of Bartlett’s (in Belke et al., 2010) “effort after meaning”. Here as well, first evaluative judgments—by priming the individual to engage—necessitate complex integration in terms of multiple relations between external entities and mental states and drive an individual to “connect [the] given pattern with some setting or scheme.”

On the other hand, if one begins with assessment for understanding first, there is actually argument for an opposite effect. According to Winkielman et al., (2003, p. 196), understanding processing, possibly because it does not engage the self, may motivate breaking-off of engagement, prematurely “bringing the cognitive activity to [an end].”

Present Study

The present study was designed as a first test of the above model-inspired argument. Using interaction with art, subjects were presented with a painting and asked to make either an initial evaluation regarding their “Liking” or “Understanding” within a set evaluation phase. This was followed by the opportunity to continue looking and to make an opposite Liking/Understanding assessment with order of questions manipulated between viewers. This paradigm was designed to assess the above three hypotheses that liking and understanding appraisals may be either: (A) distinct, in which case we would expect no interaction effect from specific assessments or from sequence/ordering. Alternatively, assessments may be (B) equivalent, as two varieties of hedonic response based on degree of processing fluency. In this case we would expect a positive correlation between liking/understanding assessments, with little or no incongruence between positive/negative answers and again no impact from question ordering. Or, (C) assessments may show evidence for a specific impact from ordering, potentially tied to Liking-Understanding sequence.

Because the third theory introduced a neural component, we also included a measurement of neural activation. This employed functional Near Infrared Spectroscopy (fNIRS), which is specifically suited to addressing this paper’s key questions. While most methodologies (notably MRI) offer high spatial resolution, poor time resolution and obtrusive design make assessing extended phases of engagement or evolutions of activation difficult (Cela-Conde et al., 2011). NIRS, which exploits properties of interaction between cerebral tissue and near-infrared light to record relative blood oxygenation, affords measure of activation both over longer periods and is also sensitive to activation change. The device used in our study (PocketNIRS, Dynasense Inc.), which recorded neural activation via only two optode pads, also allowed an upright, hands-free setting.

Region of interest was bilateral medial prefrontal cortex (MPFC, BA 10). This was selected because it has been specifically identified as important for both hedonic and meaning or understanding assessment (Jacobsen et al., 2006). More important, MPFC is noted as playing a key role for the entire proposed sequence within the aesthetic processing model. Frontomedian PFC is proposed to play a central role in the initial stimulus engagement and resulting hedonic or self-referential assessment argued as the first model stage (Nadal et al., 2008). Cela-Conde et al. (2011, p. 43) add that this area may also be tied to the priming/dissuading of subsequent cognitive engagement, and to final assimilation of first appraisals with latter informational assessments. In addition, activation in MPFC is also a basic measure of cognitive engagement.

Regarding potential hypotheses for activation, literature can again be divided into the above three arguments. If Liking and Understanding are discrete we would expect results that match previous findings from brain studies of independent hedonic or cognitive appraisals. Findings have previously shown that positive assessment of Liking creates heightened
activation, as would not understanding (Lengger et al., 2007), both indicating higher cognitive load/engagement.

If liking and understanding assessments are equivalent we expect a general trend of heightened activity in the first appraisal phase, corresponding to an individual’s attempts to fluently process. This would be followed by lowered activation in subsequent appraisal as individuals have already made up their mind. This same pattern should occur regardless of question order or actual appraisals made. If there is an L-U order effect, we expect differences between orders to be reflected in neural activation. Assessment for Liking followed by Understanding may show heightened activation especially in the latter understanding phase, due to the initial hedonic appraisal’s role as a primer of deepened processing or judgment. On the other hand, as argued by Winkelman et al., evaluating first for Understanding may result in diminished activation especially in later appraisal.

Method

Thirty-two students from Nagoya University (12f; M age = 21.3 ±2.3) participated for class credit. All were right-handed and had no special training in art.

Stimuli consisted of 18 paintings, divided evenly among three categories noted to hold potential for prompting a range of liking and understanding combinations (Leder et al., 2012). These were: 1) ‘Classic’ styles (impressionist, post-impressionist, naturalist etc.) which are both mimetic and therefore readily “understandable” and aesthetically pleasing or easy to like; 2) ‘Abstract’ paintings, which are not mimetic and therefore often less understandable but with patterns or colors which may or may not be liked; and 3) ‘Post-modern’ works (mid-20$^{th}$ c. to present) which depict mimetically understandable yet difficult or unpleasant content and therefore are often not liked. Paintings, shown on 32 in. monitor, were selected to include no depicted images/settings or to be by artists which would be identified by a lay subject.

We employed mixed factorial design with Liking (yes/no), Understanding (yes/no) and art category (classic/abstract/post-modern) as within-subject factors and question order (Liking evaluation followed by Understanding, hereafter “L-U order,” vs. “U-L”) as a between-subject factor. Participants were divided equally between the two order conditions. Participants sat in a chair in a darkened room facing the monitor (1m away). They were instructed that they would be viewing some paintings and would be asked to make a response regarding either first their Liking (responding to the question, “do you like the art?”) and then Understanding (“do you understand the art?”), or vice versa.

For each trial, participants were first shown a cue-cross for 500ms followed by a painting displayed for 10s. Participants were asked to determine their answer regarding the first Liking/Understanding question during this phase. After 10s a white circle appeared to the left of the painting, prompting keypress. Following keypress, the painting was displayed for another 10s, while the participant considered their answer to the second question, followed by another prompt and keypress. Following the second keypress, the painting was again displayed for 10s during which the participant was instructed to “only look at the art without an assessment. This was followed by blank screen and 10s rest, after which the same procedure was repeated for each artwork with order randomized between subjects. Keypress latency was recorded with Superlab software (Cedrus V4.5). Procedure was approved by the Nagoya University ethics committee.

Data Analysis

Brain activation was measured by PocketNIRS (Dynasense Inc., Japan) functional Near Infrared Spectroscopy, assessing concentration changes of oxygenated hemoglobin (CoxyHB). Two probes, each consisting of one emitter and one detector optode located 3cm apart, were placed on the forehead using double-sided medical adhesive with midpoint centered on Fp1/Fp2 positions (assessed via International 10-20 system). Based on probabilistic anatomical cranio-cerebral correlation, probes were projected to correspond to Left and Right MPFC and to cover a depth of ~0-3 cm.

Raw data was assessed for non-near infrared light/other noise. No results showed more than 10% noise data, therefore all was kept for analysis. Each individual painting trial—defined as the period from first fixation cross to final artwork disappearance including the three 10s phases—was then separated. Data was given linear baseline correction to remove longitudinal signal drift using mean CoxyHB value from the 3s before each trial start. Z-scores were calculated and transformed data for each trial was then divided into its three (liking, understanding, watching) phases. Each phase was further divided into two 5s averaged periods.

Results

In the behavioral results we found no evidence for order or specific answer effect. Across all subjects and artworks, regardless of order, subjects “liked” paintings roughly half of the time (56%, $M = 10$ paintings, $SD = 2.5$) and “understood” 54% of paintings ($M = 9.7, SD = 2.8$). In Liking/Understanding combinations, we also found all four assessments. Averaged across all art (Fig. 1), subjects “liked + understood” paintings 36% of the time. They “did not like + did not understand” 26% of the paintings. Subjects used an incongruent assessment of “like + no understand” 19.9%, and “no like + understand,” 17.8% of the time. Evaluations were evenly distributed across subjects, with each individual coming to both positive and negative liking/understanding assessments and using each of the four possible combinations at least once. Further, comparison between question orders regarding the breakdown in the four possible types of assessment showed no significant differences.

The tendency toward congruency in assessment combinations found for the complete set of artworks above also proved to be non significant. This finding, as well as lack of order effect, became more apparent when comparing between the three art types. As shown in Figure 1, art categories did show significant differences for ratios of appraisals. For “classic” works, 74% were both “understood”
and “liked”. Postmodern art showed a generally even breakdown between understanding combinations, albeit with a majority of paintings not liked. Abstract art showed higher incidence of not understanding, and even split between positive or negative liking. Comparison of L-U and U-L orders within each art type showed no significant differences.

within left MPFC for the second phase. Both the first and third phases also showed significant main effect for time (first phase, $F(1, 25) = 9.1, \Lambda = .73, p = .006$; third phase, $F(1, 25) = 10.5, \Lambda = .70, p = .003$). In the right MPFC, all three assessment phases showed significant main effect for “time” (first, $\Lambda = .67, F(1, 25) = 12.3, p = .002$; second, $\Lambda = .84, F(1, 25) = 4.8, p = .03$; third, $\Lambda = .61, F(1, 25) = 15.9, p = .001$). Other main effects or interactions were not found.

In order to further assess congruency effect, the four assessment combinations were divided into congruent and incongruent combinations. A 2x2x2x2 repeat measures ANOVA was conducted with order (2) as between-subject factor, time period (2) and congruency (2) as within-subjects factors, and with each congruency category further subdivided into each of its two respective keypress combinations (2). Main effects for “order” ($F(1, 25) = 5.6, p = .02$) and for “congruency” ($F(1, 25) = 5.9, p = .02$) were again found within the second assessment phase for left MPFC. Three-way interaction for “congruency x order x time” was also found ($F(1, 25) = 4.4, p = .04$).

To examine the three-way interaction found in the left MPFC during the second assessment phase, we also carried out two-way ANOVAs (congruency (2) x time (2)) within both L-U and U-L groups. The L-U group showed significant main effect of “congruency” ($F(1, 30) = 7.0, p = .01$) and a two-way interaction for “congruency x time” ($F(1, 30) = 4.2, p = .05$). Simple main effect tests revealed significantly higher activation for incongruent responses during both the first and the second time periods.

Figure 1: Artwork evaluations between artwork types and “L-U” vs. “U-L” question orders

Neural results, on the other hand, did show significant effect from both question order and specific answer combinations. Figure 2 shows neural activation of the L-U and U-L order groups for the four assessment combinations. As can be seen, in the first phase (either initial Liking or Understanding assessments depending on order) and in the third (“Watching”) phase we found essentially the same pattern for all appraisals. The first phase showed a flat or downward trend following artwork presentation. The final watching phase as well showed flat or slightly rising activation. While within the second phase of assessment, while U-L condition again showed a flattened/ negative trend, the L-U condition showed an increase in activation for individuals who had come to an incongruent combination of assessments. Patterns were similar for both L and R MPFC.

Three-way repeat measures ANOVA were then conducted within each of the three phases of assessment for both left and right MPFC, with order conditions (2) as between-subjects factor and with Liking/Understanding assessment combinations (4) and time period (2) as within-subjects factors. Results showed significant main effects for both “assessment combination” ($F(3, 23) = 3.5, \Lambda = .69, p = .03$) and “order” ($F(1, 23) = 5.6, p = .02$) within the second assessment phase for the left MPFC. We also found significant three-way interaction for “order x assessment combination x time” ($F(3, 23) = 3.56, \Lambda = .68, p = .03$)
finding, only in L-U order, showing that initially “not liking” created higher activation in both left and right MPFC (left, $F(1, 15) = 5.0, p = .04$; right, $F(1, 15) = 9.9, p = .007$). No significant differences were found for comparison of art categories after controlling for evaluation combinations within each type. Periods of keypress (following display of keypress prompt) did not show any notable differences. Keypress latencies as well showed no significant differences.

**Discussion and Conclusion**

We do find compelling, and somewhat confounding, evidence for a new approach to the question of our integration of hedonic/cognitive assessments. While in behavioral evidence there was no effect from order, and no effect from positive or negative answers on subsequent judgments. Appraisal combinations were themselves not affected by any criteria beyond the specific variety of art. Where classic art was primarily liked and understood, postmodern was understood but not liked, and abstract was not understood but equally liked or disliked.

However, when neural activation is considered in tandem with the behavioral results, evidence suggests a quite different interpretation and does indicate that there may be both a biological interconnection between appraisals and an appraisal order effect. Within the U-L order, activation showed a negative or flattened trend with no notable changes throughout the entire engagement. This finding was essentially the same regardless of specific evaluations to the liking and understanding questions or their combinations. On the other hand, when the appraisal sequence began with a first hedonic evaluation for liking followed by then understanding, there was significantly higher activation in the MPFC. This finding was further tied to presence of incongruency between the liking and understanding assessments, pronounced in the second (Understanding) evaluation phase and predominant to the left hemisphere, although the same general trend was also observed in right as well. There was also significant evidence for higher bilateral MPFC activation when “not liking” the art within the first Liking assessment phase, again only when a viewer began their interaction with hedonic assessment itself.

Keeping in mind that this is of course tentative evidence, the order difference does appear to support a hedonic-driven theory of Liking/Understanding integration. As discussed above, this suggested a functional progression whereby we process the environment first by hedonic assessment followed by processing for understanding or integration of informational/contextual aspects. It was further argued that initial hedonic assessment should fit an evolutionary role, connecting to appraisals of self-relevance, which would act to prime an individual for subsequent involvement in the attempts to understand. Priming was also argued to recruit the MPFC. Researchers have found higher activation within this brain region with stimuli that evoke self-reference (Jarcho, Berkman, & Lieberman, 2011). Similar argument are also made for experience of “novelty,” “interestingness” or basic attention—relating to an object’s personal uniqueness or appeal to one’s self (Lengger et al., 2007). The MPFC has also been connected to top-down processing or attempts at integration of multiple elements (Cupchik et al., 2009), as might be posited to arise in latter processing or integrative understanding stage. Because self-referential involvement was argued to be a vital element in motivating latter engagement, it was argued that given an initial hedonic assessment it would be this L-U order and priming affect that would create a discernable increase in brain activation. On the other hand, Understanding-led order, because it may be tied to more objective or “externally-generated” context-based judgment, was argued to not cause such a self-engagement (Cela-Conde et al., 2011) and lead cognitive activity to diminish or to never be recruited in MPFC.

The fork in neural activity—observed within the second Understanding phase of the L-U order, and between congruent and incongruent cases—may also be fit to this model. It may have been that Liking-Understanding judgments, having first engaged the self, and where an understanding judgment then proved to be incongruent, reflected a higher need for processing, justification and assimilation of these assessments. Theoretically, this may have essentially created the conditions for Bartlett’s (1932) “effort after meaning” in which having been primed by the initial hedonic phase, an individual is led into a process of integrating appraisals or connecting the given pattern with some setting or scheme. Role of hedonic-led incongruency between liking and subsequent understanding assessments as specifically leading to such heightened activation was also suggested by Cupchik (1994). Whereas, for U-L order, despite same evaluations of the art, this deepened engagement even in an incongruent case was not found.

Distinction between hemispheres also can be connected to previous discussion of potential processing sequence. Research suggests right hemisphere predominance in initial appraisal, especially regarding hedonic assessment. This may be due to proposed tie between right-lateralized frontal-parietal areas and evaluation of aesthetic quality or global properties of a stimulus (Jacobsen and Höfel, 2003). On the other hand, the significant differences in the second understanding phase within the left MPFC may correspond to research arguing that this hemisphere may be tied to attempts to fit evaluations to context (Fedemier & Kutas, 2002).

Higher activation for not liking—only found for the L-U order within the first assessment phase—also can be connected to the model discussion. While prior research on discrete appraisals has shown a generally positive effect, primarily in orbitofrontal and dorsolateral prefrontal activation, when subjects positively like a stimulus (Kreplin & Fairclough, 2013), Jacobsen and Höfel (2003) have suggested correlation between negative aesthetic appraisal and activity in PFC, specifically medial regions. This was especially argued to occur within an initial stage of processing and with complex or important stimuli such as art, potentially because an initial appraisal that one does “not like” results in higher need for justification/implication of self.
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fluency arguments may not be suitable for considering

higher-level processing of art—and further suggesting that we should look more towards hedonic assessments’ influence.

Most important is our new introduction of neural evidence to what has traditionally been a primarily behavioral question. This does appear to suggest that there is a clear effect on the brain from processing order. This in turn may be driven by initial hedonic processing, and demands future attention to the integration of liking and understanding assessments, especially those which had heretofore employed only behavioral evidence. While this paper can only be a start, we hope that this will open the door to such future assessment.

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References


Unsuccessful Learning of the Acknowledged Effectiveness of Form Complication

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Abstract

We have assigned the task of tracing some non-figurative and non-symbolic closed shapes to some subjects, in order to draw interesting shapes. The same subjects have then expressed a preference for the shapes which they perceived as being more interesting. They were then asked to carry out a task which was similar to the first and we asked ourselves whether it would have been possible to detect, in their new drawing, some influences of the shape which they considered to be the most interesting, in particular in those cases in which such preference had been assigned to a drawing which differed from the one the subject had produced. The attempt was that of trying to detect a possible hiatus between production and choice, or a possible incoherence between action and judgment.

Keywords: failure to assimilate; production drawings; choice drawings.

Failure to assimilate the proven effectiveness of the complication of the form

Introduction. “If we think about the general laws of perception, we can see that when actions become a habit, they become mechanical” “The aim of art is that of transmitting the impression of the object as a ‘vision’ and not as a ‘recognition’; the process of art is the process of ‘estrangement’ of the objects and the process of the obscure shape which increases the difficulty and duration of perception.” (Šklovskij, 1974)

Šklovskij believed that art exists in order to revive the perception of life and that, to obtain such result, art uses two devices: “uniezwyklenia rzeczy i chwytu utrudnionej formy, potęgującej trudność i trwanie odbioru” (Šklovskij, 1966). (estrangement of things and the complication of the form, with which it tends to make perception more difficult and to prolong its duration). However, together with ‘estrangement’ Šklovskij finds in the complication of the form an element which participates to the aesthetic effectiveness of the perception of an object. There is a vast literature which has dealt with analyzing the aesthetic preferences for complex stimuli. We therefore ask ourselves a question which we will try to answer during the following experiment: will an individual which has recognized in complexity a determining parameter for preference judgments regarding the drawings then use such information in the production of his/her drawings? More specifically, will this preference for complex shapes stay in his/her memory when he/she changes task from judging drawings to producing them?

After assigning the task of tracing non-figurative and non-symbolic closed shapes by connecting a certain amount of dots, in order to draw more interesting shapes in a certain amount of seconds, we have hypothesized that the interacting subject produces different drawings and that it is possible to find in those drawings a certain preference for a particular way of creating shapes, and so, consequently, a certain preference in the way in which the subject carries out the required task. We have then hypothesized to show the drawings to all the interacting subjects, and then ask them to judge the shapes and say which ones they find more interesting. A subject who has chosen a drawing which differs from the one he/she had previously produced, might elaborate this piece of information which might then influence his/her later production of drawings. In other words, when judging the drawings, each subject will have the possibility to learn a better response to the first task and, if such task were to be carried out again it might have a different outcome. The hypothesis at the heart of this text instead, states that even after experiencing a drawing which is more functional to the required task than their own, conformism will lead most subjects to stick to a shape and a drawing which are similar to the previous ones they produced. This would show a hiatus between production and choice, a semantic gap; in preference, as the tendency to produce drawings which are quite far from the preferred one, as the tendency to choose drawings which are different from those the subject has produced. Such failure to assimilate the preference assigned to the most interesting shape, which is evident in the conformist attitude of proposing the same shape again (the shape which was thought to be less interesting), represents a limit to the possibility of re-eliciting the response to the same stimulus and a limit (referring specifically to this experience) to the imaginative possibility of using something that, coming from the external reality, we have found to be interesting.

Stimulus. The stimulus consists in a 20 x 20 cm square which presents 100 dots equally distributed on its inside.

Sample. There are two groups, the first one composed of 76 pupils attending the middle schools ‘C. Giaquinto’ and ‘G. S. Poli’ in Molfetta (Italy) (31 boys, 45 girls), aged 12 to 13. Afterwards 24 more pupils will be involved in order to evaluate the differences in the drawings produced by each subject in the first group.

Method. The subjects in the first group are asked to trace non-figurative and non-symbolic closed shapes by connecting the required number of dots within the required amount of time, in order to obtain the shape which each of
them finds most interesting. The first shape is formed by connecting 31 dots in 30 seconds, the second one by connecting 35 dots in 90 seconds and the third one by connecting 21 dots in 70 seconds. So as to diversify the requests, the first shape was drawn with a red pencil, the second with a green pencil and the third one with a yellow pencil. Afterwards the drawings were collected and displayed on a wall. The subjects were then asked to look carefully at the drawings (which had not been seen during their preparation and which are not signed) and to express a preference regarding the shape which was, for each color, found to be more interesting. A new task was then assigned: connect 31 dots in 40 seconds with the same aim and using a cyan colored pencil.

Discussion. We consider the shapes produced by each interacting subject as the best answer to the request (i.e. the production of the most interesting shape).

Taking into account the initial hypothesis regarding the possibility of detecting a certain preference in the ways of creating shapes in the various drawings produced by the same subject, it is interesting to notice how, in many cases, it is possible to find some resemblance (the possible resemblance among the various drawings produced by the same subject was determined by the second group of pupils). In preferring one way of creating shapes, it is possible to notice a projection of the subject with the object-shape; or better, the possibility to recognize the creator of the various responses.

However, the aspect we want to consider, according to the hypothesis, reveals itself in the following step, i.e. when all the subjects are observing all the drawings and they have to express their preference for the shape which they believe to be the most interesting. By looking at the answers, it is possible to notice a quality of solutions which is inversely proportional. The subjects choose the shapes which they believe to be the most interesting and, in the majority of cases, they are quite different from those they produced (the majority of the shapes which were produced by a subject are judged, by the same subject, as being the less interesting).

We know that the complexity of the form, until the decadence of the judgment of complexity (Galeotti, 1996) is preferred to simple shapes or to very complex ones, as demonstrated by the studies on the complexity of aesthetic stimuli (Birkhoff, 1928; Phillip & Fischelli, 1945; Shannon & Weaver, 1949; Hochberg & McAlister, 1953; Attnave, 1954; Fitts et al., 1956; Berlyne, 1958; McFarland, 1969; Leeuwenberg, 1969, 1971; Vitz & Todd, 1971; Morin, 1974; Lombardo, 1979; Raab, 1982; Luhmann, 1986; Galeotti, 1996). As a matter of fact, when the interacting subjects look at all the drawings which have been produced, to decide which shapes they find most interesting, those chosen are indeed the most complex ones.

We have therefore compared the expression of each expectation (Wittgenstein, 1976), of each drawing and evaluating judgment among all expectations.

We continue then so as to answer the initial question at the basis of this experiment: will an individual who has recognized in complexity a determining parameter for his/her preference judgments regarding drawings, use it then in his/her drawings? More specifically, will this preference for complex shapes stay in his/her memory when he/she changes task from judging the drawings to producing them? After judging the drawings, and after having decided which shapes they believe to be the most interesting, the subjects are asked to produce a new drawing: with parameters similar to the previous ones and with the same aim (connect 31 dots in 40 seconds). Despite having experienced the recognition of the most interesting shapes, the majority of the subjects are tied to a certain construction of a shape, or, in other words, concerning the experiment, there is no degree of evolution which can be imputable solely to the cyan shape (see the appendix for parameters and results regarding the analysis of shapes). In the majority of cases the new shape is different from the shape which had been judged as being the most interesting; the separation between production and judgment, the distance between preference in producing shapes and preference in drawing them, in judging given shapes, is therefore evident. Together with the distance of aesthetic preference produced in the two tasks, the anchorage to a certain preference in the creation of shapes reveals a lack of heuristic method. This causes a failure to learn; at least in the sense that the answers to the request which aims at the solution of the same objective do not learn from their own experience and do not improve the effectiveness in their response to the request. Nonetheless, the shapes which was recognized as being the most interesting has allowed each subject to know his/her best shape, among those present, as the best response to the task (apart from who produced it) and therefore ready to be used. Even though the negative feedback might make one think that the response of the majority of the subjects is far from being the best response to the task, this does not affect the transformation of the response to the following requests which present similar characteristics and similar objectives. In other words, we can state that if the recognition of the most interesting shapes (and therefore of the task which was carried out best) is a Plane, this is not assimilated so as to become an Image, speaking in Pribram’s terms. (Miller, Galanter, Pribram, 1960) The failure to change the Image, which can be noticed in the continuous solutions put forward by the subjects time by time, reveals a failed execution of Planes for the gathering, the storing and the transformation of information. It is clear that, at a certain point, though each subject knows which response he/she believes to be the best one, such response does not appear in the following tasks, in which it is required. In this case there is no evidence of a mnemonic trace which would reveal the experience of a task which is similar to the new one. The difference in the response to the two tasks underlines the diversity of the two tasks and the different preferences in carrying out such tasks; it also shows a lack of interrelation of the two tasks by the subjects. Consequently, a conceptual warp, which makes the relationships between reality and fantasy a controversial one, with respects to the tasks and values which are satisfied, is revealed. It is evident how, the lack of assimilation regarding
the preferred shape, when compared to the one produced, poses a limit to “the role of fantasy as an instrument used to elaborate the recognition of an external reality” (Ammanniti & Stern, 1995 – my italics).

It is possible to see the value of the shapes which were created, in the difference between the value and validity of the objects which have been produced and of the objects which have been judged in the preference of the ways in which they were produced, in respect the validity assigned to the shapes produced by others and in respect to a required task. It is therefore possible to state that “the action is not always coherent with judgment” (Galeotti); or, specifically that, when creating a drawing, people do not always express a preference for what they perceived as being most interesting in the external reality.

Appendix

The morphospatial parameters on which the analysis of the drawings is funded (see end of the text), taking into consideration their preference, are respectively: the number of dots connected, in each shape, in respect to the number of segments produced to connect them, and consequently, the unevenness of the resulting shape (classes of elements and their relative frequency, e.g. horizontal, vertical and oblique segments); redundancies; symmetries; dimensions; collocation in space on the sheet of paper. By examining some shapes, from the less complex to the most complex ones, similarities and differences among the drawings realized by the same subject will be underlined.

The sequence of numbers indicates the four drawings, respectively for each color (r = red, v = green, g = yellow, c = cyan) for each participating subject. For the most simple drawings it is possible to notice a preference for extensions, external extensions to a bigger, central body, or which extend themselves in an L shape. Even the more complex shapes have quite a similar construction, such as the shapes in row number 10 (shape 10v seems to be the favorite among shapes of the same color); though it might be possible to notice a sort of evolution from shape 10r to the clearer polyformity of shapes 10v, 10g, 10c, such shapes are not so different from each other, and, concerning the experiment, it is not possible to notice a sort of evolution which is linked solely to the cyan shape. The same can be said regarding more complex shapes, such as those in row 8. Just like the shapes in row 10, it is possible to notice the evolution of a certain complexity starting from shape 8r to the others, and in the same way it is possible to state that such evolution does not belong solely to shape 8c, which was judged as less complex than shape 8v.

Shapes having a similar complexity and which have resulted as particular favorites are those in row 2 (shape 2r is the most favorite together with shape 4r, among those shapes of the same color). Once again there are no particular or evident differences among different shapes. The preference for shape 4r seems to be odd, for this shape is incomplete, it is not closed as the task required.

Regarding this, though, we can consider complexity, and not linearity or ambiguity, as the main reason for such preference, summing up with a note on complexity by quoting a passage by E. Raab (1982), extracted from an examination of the Berlyne theory of activation, in which he says: “Cognitivist aesthetics make another hypothesis more plausible: at the basis of the relation of the observer lie not so much the structural characteristics of the stimulus, but the active and dynamic re-codifications which they induce. (...) The whole operation is gratifying and it gains an aesthetic value when the observer can obtain almost semantic information from such abstract work.”

Acknowledgments

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Figure 1: Some results
Figure 2: Some results
Abstract
Out of methods to measure the degree of person’s happiness, well-being, and related phenomena, those ones should be singled out which use non-verbal stimuli and simple procedures. Such method was derived based on visual illusions treated as a result of a person’s tendency to increase his/her ‘harmony of perception.’ A set of 12 stimuli is proposed to a participant, each stimulus depicting two “stubs”: thin and thick, the ‘point of harmony’ being fixed when both lengths are perceived as equal. After the experiment, an interview with each participant took place, concerning three parameters: (a) his/her health, (b) family life, and (c) social status. Then the participants were divided into groups responding to different degrees of well-being. The members of such groups showed different ‘points of harmony,’ this effect being capable of practical application in mass investigations, including cross-cultural ones.

Keywords: perception; illusions; information theory; measurements; well-being; happiness; harmony; cross-cultural investigations.

Self-Consistency and Harmony as Roots of Principal Everyday Life Concepts
Usually the most important «popular perceptual concepts» of our everyday life (such as Space, Time, Self-Estimation, and so on) are formed due to subject’s inclination towards self-consistency of various requirements inherent in different fields of perception. As a result, in each of such cases, something like a ‘harmonious alloy’ appears which is then ‘confirmed and fastened’ by appropriate means of the cultural sphere. (Evidently, constituents of each ‘harmonious alloy,’ as well as their proportions, are determined by its nature, i.e., ‘harmonizing functions.’) Hence, sometimes certain ‘special tools’ are needed, in order to support the functioning of each ‘popular everyday perceptual concept.’

In the framework of the ‘systemic-information’ approach (see, e.g., Golitsyn, 1997; Petrov, 2007), a set of ‘special cultural tools’ was theoretically deduced, proceeding from the ‘need to train’ joint working of different modalities of human mental life (Golitsyn & Petrov, 1995; Petrov, 2005). It means that each kind of art (music, painting, poetry, and so forth), as well as each of its branches (genres) is nothing else than a special ‘training tool’ to unite a certain group of psychic modalities.

Moreover, it occurs that there exist some ‘super-mighty’ integrating needs generated by the most common (and widespread) informational processes, and in such cases, very important, fundamental perceptual concepts are born. Thus, the very Concept of Perceptual Space (including its three dimensions – length, width, and depth) is a logical consequence of the ‘tendency of expansion’ inherent in the human system of information processing: it is desirable to increase the entropy of the system’s states, – but first of all, it is desirable to unite (to ‘embrace’) all the objects and phenomena perceived, to form a certain integrity. The most economic way to realize this integration, is to generate a Concept of Perceptual Three-Dimensional Space. (Exactly such was the unanimous conclusion of several models proceeding from different initial postulates.) In turn, to support social functioning of this concept, some special ‘artificial tools’ can be invented by the system of Culture, and the most strong of these special tools is figurative painting.

Another integrative need, very common and very mighty, deals with the necessity to establish causality – to connect ‘cause and effect’ (e.g., causal link between the lightning and the thunder). This necessity is a logical consequence of the ‘tendency of idealization’ also inherent in the human informational system: it is desirable to minimize the entropy of the system’s ‘interpretational errors’ while perceiving combinations (joint meetings) of various objects and phenomena. To realize this tendency by the most economic way, it is desirable to create a Concept of Perceptual Time. In turn, to provide social functioning of this concept, certain ‘artificial tools’ are needed – and they were really invented by Culture, the strongest of them being music. (About concepts both of Space and Time, as well as anthropological roots of painting and music, see, e.g., Petrov, 2012.)

In general, evidently, certain latent (hidden) perceptual concepts penetrate all the mental life, including its social aspects. Sometimes we see their ‘traces’ – e.g., in the form of such ‘integrative concepts,’ as Happiness, Well-Being, Social Equilibrium, and so forth. However, we can judge of them only on their ‘projections’ onto various ‘material axes’– such as subject’s estimations of various objects and/or phenomena. Thus, very long ago J.Bruner (1968) showed that children belonging to poor families, overestimate the sizes of coins, in contrast with children belonging to rich families. It means that such latent social variable (hidden concept) as the degree of poverty, penetrates the children’s mentality.

So we may suppose (and then verify this hypothesis empirically) that such a ‘hidden concept’ as the Feeling of Happiness (or Well-being, or something close to this) does really exist in the society, penetrating the mentality of its members. But how can we measure this feeling, which possibly lives in our subconscious sphere? Evidently, here the best way is to turn to illusions, evidencing in favor of rather featured distortions while perceiving various objects. One of such typical visual ‘illusions of contrast’ consists in comparing two objects of the same length, but differing in their width: usually the thick object seems to be shorter than the thin one. (About the informational approach to the problem of illusions see, e.g.,

Visual Harmony and Illusion-Based Test for Subject’s “Happiness”

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Golitsyn, 1980; Golitsyn & Petrov, 1995.) In the case of this illusion, we may suppose that we deal with such hidden latent variable as the degree of a person’s satisfaction by his life, well-being, etc. Here various motives may occur involved, e.g., the motive of ‘compensation’ (which generates, for instance, such truisms of commonsense thinking as ‘if a girl is pretty, hence she is stupid,’ or ‘though somebody is rich, however, he is not happy’).

In general, when considering the subject’s self-estimation of his/her life, we should proceed from the informational theory of emotions (Golitsyn, 1997; Golitsyn & Petrov, 1995) according to which the subject’s emotion is nothing else but the indicator of the effectiveness of his/her activity: if the effectiveness is high – the emotion is positive, whereas low effectiveness results in subject’s negative emotion. (Later we shall return to this topic – when considering personal parameters of the participants of the experiment.) So, we may suppose that the above visual illusion would provide us with a test for something like the feeling of well-being?

**Experiment**

A set of 12 pictures was prepared, each presenting two stubs: thin and thick, with lengths $I_1$ and $I_2$, respectively (about the details of the experiment see: Golitsyn & Petrov, 1982). The pictures differed on the relations of the lengths of stubs, from $I_2/I_1 = .92$ to $I_2/I_1 = 1.36$, with a step of .04. Dimensions of each picture were 205 ∙ 415 mm, all of them being mounted (in a random order) in three horizontal rows (4 pictures in the row) on a large sheet of yellow paper (850 ∙ 760 mm). The sheet was placed at a distance of 3 meters from a participant. One of the pictures used in the experiment, is shown by Figure 1.

![Fig 1. One of the stimuli used in the experiment: $I_2/I_1 = .92$.](image)

Each participant was asked to compare the length of the stubs: is the thick one longer than the thin one, or shorter, or their lengths seem to be equal? One of these three versions (concerning the participant’s opinion about each picture) was fixed in a special blank. The entire testing procedure for each participant, lasted about 3-4 minutes. The experiment was followed by a non-formal conversation (interview) – separately with each participant – about his/her life (see below).

All the participants (without any exceptions) revealed quite similar general character of responses, which evidences in favor of rather featured effect of the visual illusion discussed. In full agreement with the nature of this illusion, when perceiving stimuli with rather low values of the relation $I_2/I_1$, the participant estimates the thick stub as shorter than the thin one, whereas when dealing with high values of $I_2/I_1$, estimations occur quite opposite. Between these two ‘stable zones,’ there exist an intermediate zone, which can be also named the ‘zone of uncertainty’ where the participant perceives both stubs as equal; the width of this zone $\Delta$ can be measured as the number of steps (gradations) between the stable zones. The middle of this intermediate zone is usually treated as the estimation for the effect of illusion studied; this effect is fixed in the form of the index $x = (I_2/I_1) - 1$. [For instance, a participant showed the first stable zone from $I_2/I_1 = .92$ to 1.04, and the second stable zone from 1.20 to 1.36, so the zone of uncertainty covers three steps, $\Delta = 3$, and the middle of this zone $I_2/I_1 = 1.12$, hence, the effect of the illusion for the given participant equals $x = 1.12 - 1 = .12$.] The distributions of the effect of illusion $x$ and the size of the zone of uncertainty $\Delta$ for this group of participants, is shown by Figure 2.

![Fig 2. Distribution of the participants over the values of the effect ($x$) and the size of the zone of uncertainty ($\Delta$).](image)

Such data were the basis for our analysis of the potentialities of the test proposed. (As for concrete
mechanisms of this illusion, they are considered in the framework of the systemic-informational approach, in our early publication: Golitsyn & Petrov, 1982.)

**Auxiliary Results: Rejection of Low-Level Hypotheses**

First of all, it is desirable to eliminate possible influences of purely physiological reasons, for instance, the keenness of vision. This influence (as well as other analogous influences) should be connected with the participant’s width of the zone of uncertainty \( \Delta \). The lower the keenness of vision, the wider should be the value of \( \Delta \), hence these two variables (\( x \) and \( \Delta \)) are to be connected by a monotonic dependence. However, when comparing participants with each other, we see no such connection. Really, the rankings of 31 participants over their values of \( x \) and \( \Delta \) show very low Spearman coefficient of rank correlation (\( .17 \)). Besides, ‘local proving’ of such connection was realized: for 5 participants with low values of \( \Delta \) (Spearman coefficient about \( .41 \)), for 8 participants with high \( \Delta \) (\( -.11 \)), for 10 participants possessing low values of \( x \) (\( .00 \)), for 6 and 11 participants with high values of \( x \) (\( .43 \) and \( .02 \) respectively). The absence of correlation evidences in favor of negligible impact of this reason into the phenomenon studied.

As well, the phenomenon in question can be influenced by some features of ‘decision-making’ realized by participants, e.g., how categorical is the participant when judging about the lengths to be compared. Here the above mentioned absence of correlation between \( x \) and \( \Delta \), is also indicative of low impact of such ‘decision-making’ features. Of course, one can suppose rather complicated ‘mutual annihilation’ of both influences; however, such ‘exact balance’ (besides, valid for different ranges of the scales of \( x \) and \( \Delta \)) seems to be low probable. So, let’s turn to our ‘high-level hypothesis.’

**Principal Results: Influence of Well-Being**

On the basis of a non-formal after-testing interview with each participant, all of them were divided into three groups:

A) subjects with high degree of well-being;
B) subjects with intermediate degree of well-being;
C) 7 males and 4 females which showed the lowest gradations at least on one parameter, and intermediate gradation(s) over other parameter(s);

For each group, average values of the effect \( x \) and zone of uncertainty \( \Delta \) were calculated: \( x^\prime \) and \( \Delta^\prime \), together with their standard deviations: \( \sigma_x \) and \( \sigma_\Delta \). Appropriate data are summarized in the Table below.

Table 1. Experimental results in the light of non-formal interviews

<table>
<thead>
<tr>
<th>Group</th>
<th>( x^\prime )</th>
<th>( \sigma_x )</th>
<th>( \Delta^\prime )</th>
<th>( \sigma_\Delta )</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (high)</td>
<td>.051</td>
<td>.010</td>
<td>2.9</td>
<td>1.5</td>
</tr>
<tr>
<td>B (intermediate)</td>
<td>.087</td>
<td>.021</td>
<td>3.9</td>
<td>0.9</td>
</tr>
<tr>
<td>C (low)</td>
<td>.127</td>
<td>.023</td>
<td>3.7</td>
<td>1.4</td>
</tr>
</tbody>
</table>

We see rather featured differences between the groups over their values of the effect \( x \): the first group differs from the second one more than on the sum of their standard deviations, the second group differs from the third one less than on their deviations’ sum; however, the third group differs from the first one more than on two sums of their standard deviations! (On the contrary, inter-group differences over the values of the zone of uncertainty \( \Delta \) occurred to be quite negligible – less than on the values of standard deviations, which again evidences of rather weak impact of low-level perceptual processes.)

So, we may conclude that this illusion does really measure the degree of person’s satisfaction with his/her life, and this effect can be used in various mass investigations, both psychological and sociological, both national and cross-cultural. For instance, perhaps it would be possible to build Lorentz distributions of the population of different countries, over the values of ‘happiness,’ to calculate Gini coefficients for such distributions, and so forth.

Though now we are at the very start of such investigations and some of their details require further elaboration, the method seems to be rather prospective: it is based on non-verbal procedures, besides very easy for mass investigations.

**References**


Aesthetic Appreciation of Tactile Unity-in-Variety in Product Designs

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Abstract

The principle of unity-in-variety has recently been shown to affect visual aesthetic appreciation of product designs. We investigated whether this principle can also account for tactile aesthetic appreciation of products. Design students rated nine car keys on unity, variety, and aesthetic appreciation through tactile exploration only. Results revealed that unity and variety, while negatively correlated with each other, both positively influence aesthetic appreciation. This implies that there is an optimal balance between tactile unity and variety that is aesthetically preferred. These results replicate results found in the visual domain and provide evidence for unity-in-variety as a multisensory aesthetic design principle.

Keywords: aesthetics; unity; variety; product design; tactile; design principles

Introduction

Aesthetic appreciation of product designs often involves the use of multiple sensory modalities. While vision has received a large amount of attention in the past (Blijlevens, Carbon, Mugge, & Schoormans, 2012; Bloch, 1995; Chang & Wu, 2007; Hekkert, Snelders, & van Wieringen, 2003; Veryzer, 1993), tactile features of products can become more important over time and can even outweigh the importance of vision (Fenko, Schifferstein, & Hekkert, 2010). Despite this, the domain of tactile aesthetics is still largely undiscovered and little knowledge exists on the aspects that influence the appreciation of touching and feeling products (Carbon & Jakesch, 2013). In this research, we aimed to explore some of this uncharted territory by assessing whether the design principle of unity-in-variety can explain part of tactile aesthetic appreciation of products.

Unity-in-Variety

The principle of unity-in-variety states that people appreciate the perception of variety, but for this variety to be enjoyed, we also need to see the unity in this variety (Berlyne, 1971; Fechner, 1876; Hekkert, 2006). Hekkert (2014) developed an evolutionary based Unified Model of Aesthetics which, amongst others, discusses unity-in-variety as an important principle explaining aesthetic appreciation for product designs. In this model, two evolved motivational drives are argued to underlie peoples’ preferences for a balance between unity and variety: a need for safety and a need for accomplishment. The perception of unity can fulfil a need for safety by facilitating perceptual understanding. Detecting properties in objects (whether it is a product, landscape, or painting) that help perceive the whole, order, and coherence, aid in making perceptual sense of the environment. Consequently, this sense making is aesthetically appreciated. On the other hand, the perception of variety can fulfil the need for accomplishment because it satisfies the natural urge to explore and engage in new experiences. Detecting variety in an object helps individuals to broaden their horizons and acquire new perceptual sensations and this perception of variety is therefore aesthetically appreciated. Hence, it is argued that both unity and variety positively influence aesthetic appreciation. Recent research on the principle of unity-in-variety has indeed shown that people aesthetically appreciate the visual perception of both unity and variety in product designs (Post, Blijlevens, & Hekkert, 2013a, 2013b). Even though theorized, it has not been empirically verified whether the principle unity-in-variety explains aesthetic appreciation of product designs in the tactile domain as well. In the current research, we aim to fill this gap in the literature.

Tactile Aesthetics and Unity-in-Variety

Literature on tactile aesthetics is limited (Ekman, Hosman, & Lindstrom, 1965; Essick, James, & McGlone, 1999; Essick et al., 2010; Grohmann, Spangenberg, & Sprott, 2007). Results of these researches, in summary, show that people appreciate soft and smooth tactile sensations, while disliking rough and sharp tactile experiences. However, most research was performed using simple objects (e.g. sanding paper, cloth, brushes) that could not be freely actually explored. Whenever more complex objects or actual products were used as stimuli, aesthetic appreciation was not explicitly measured. Moreover, many more tactile properties, besides
roughness and sharpness, can be thought of to influence aesthetic appreciation of product designs. For example, it has recently been theorized that the Gestalt laws of proximity, similarity, good continuation and closure may also influence tactile perception and its aesthetic appreciation (Gallace & Spence, 2011). Because these Gestalt laws influence the perception of unity and variety in the visual domain (Eysenck, 1942; Kellett, 1939), we argue that people can tactually perceive unity and variety in product designs as well.

In order to determine whether people can indeed form impressions of unity and variety through their tactile senses, and to assess whether these unity and variety impressions can influence tactile aesthetic appreciation, we performed a study using car keys as stimuli. We hypothesize that, similar to the visual domain, tactile unity and variety are negatively correlated. Furthermore, we hypothesize that unity and variety positively influence aesthetic appreciation.

Method

Participants

Students of the Automotive Design minor at the faculty of Industrial Design Engineering (Delft University of Technology, Delft, The Netherlands) were enrolled to participate in a study on the tactile perception of car keys. All of the 26 participants completed the study and were used for the analyses (mean age = 21.54, SD = 1.42, 21 male).

Stimuli

Nine car key designs that varied as much as possible in the tactile aspects of unity and variety were chosen as stimuli (Figure 1). All car keys were duplicates of original car keys (WVO Trading BV, Nunspeet, Netherlands). Several important differences between the duplicates and original car keys exist. The materials used in the duplicates (e.g. rubber, plastic and metal) were highly similar between all the car keys, while there is a higher variety in materials used in actual car keys. This decreased confounding effects on aesthetic appreciation due to variances in material qualities. Another difference between the car keys and duplicates was that there were no electronics in the duplicates. The lack of electronics made the car keys and button presses feel fake. Therefore, the different parts were glued together to increase their rigidity. The use of glue also made it impossible to press down the buttons in the car keys, minimizing the influence of interaction behaviour. Moreover, metal weights were added to the car key duplicates to increase both the rigidity and weight of the car keys.

Procedure

Participants rated all nine car keys on 7-point scales (1: fully disagree, to 7: fully agree) measuring tactile unity, variety and aesthetic appreciation. This questionnaire was an adaptation of a questionnaire measuring the same factors in the visual domain (Post et al., 2013b). Unity was measured using the items: ‘This design feels unified’, ‘This design feels orderly’ and ‘This design feels coherent’ (Cronbach’s α = .840). Variety was measured using the items: ‘This design conveys variety’, ‘This design is made of different parts’ and ‘This design is rich in elements’ (Cronbach’s α = .670). Aesthetic appreciation was measured using the items: ‘This product is attractive to touch’, ‘This product is pleasing to touch’ and ‘I like touching this product’ (Cronbach’s α = .920). Both the item order and stimuli order were fully randomized to eliminate order effects.

Respondents were situated in front of a table on which nine adjacent trays were placed that each contained one key. A large cloth was suspended in the air so that participants could not see the car keys, yet holding the car keys would be possible without the cloth touching their hands. Participants could sit at the table and were informed that the products were duplicates of car keys and had limited functionality. Instructions explicitly mentioned to rate the tactile appearance of the products and not the expected functionality or quality. Participants were instructed to take their time to tactually explore all the car keys at least once before they started rating them. Final rating of the car keys was done using a paper-and-pencil questionnaire, feeling the different car keys from left to right in successive order. Participants were free to use either one or two hands when feeling the car keys.

Figure 1. Example of two stimuli used in the study. The left car key was regarded as more unified than the right car key. This is likely because of its more symmetrical and continuous shape

Results

Pearson correlations were calculated for unity, variety and aesthetic appreciation. In line with our predictions, unity and variety correlated negatively with each other (r = -.391, p < .001). Also as expected, unity correlated positively with aesthetic appreciation (r = .610, p < .001). Variety did not correlate significantly with aesthetic appreciation (r = -.064, p > .05). However, similar to the studies on unity and variety for visual aesthetics, partial correlations showed that unity and variety suppress each other’s effect on aesthetic appreciation, because the partial correlation of variety with aesthetic appreciation was significant and positive (r = .239, p < .001). The partial correlation between unity and aesthetic appreciation was slightly higher than the bivariate correlation (r = .637, p < .001). In order to determine the amount of variance the predictors of unity and variety can explain for the dependent variable of aesthetic appreciation we
performed a linear regression analysis. The regression model explained 40.8% of the variance on aesthetic appreciation for the predictors of unity (p < .001, β = .691) and variety (p < .001, β = .206).

**Discussion and Conclusion**

In this research, we contributed by investigating whether the principle of unity-in-variety, known to influence visual aesthetic appreciation, influences tactile aesthetic appreciation of product designs as well. Our results show that both tactile unity and variety positively influence aesthetic appreciation, while unity and variety are also negatively correlated. This indicates that, similar to the visual domain, there exists an optimum balance between tactile levels of unity and variety that is aesthetically preferred.

Although a small start, with this study we hope to have opened up a way to investigate tactile aesthetic sensations and give vocabulary to talk about them in terms of unity and variety (Gallace & Spence, 2011). The principle of unity-in-variety is common language in visual aesthetics and makes it possible to study and comprehend the appreciation of complex visual stimuli in a holistic manner. By applying this principle to tactile aesthetics, it can function as a bridge to better understand the similarly complex relation between the perception of material properties (e.g. hardness, elasticity or temperature) and Gestalt properties (e.g. symmetry, closure or proximity), and their subsequent aesthetic appreciation (Gallace & Spence, 2011; Sonneveld & Schifferstein, 2008). The development of such knowledge on the interplay between product design properties and unity-in-variety can provide guidelines for designers that will help them design products that are even more aesthetically pleasing to touch.

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**References**


Aesthetic Stability in Development

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Abstract

The stability of human aesthetic preferences has been little studied. Even basic parameters such as the typical level of stability of healthy adults are unknown. This cross-sectional study focuses on stability in early child development utilizing aesthetic preference for paintings and photographs as a means of measurement. Our results show that while stability does not differ for paintings versus photographs, older children (7-9 years) are significantly more stable than younger children (3-6 years). In addition, older children perform significantly better on an explicit memory task though memory is a weak predictor of stability compared to age. Our results suggest that aesthetic stability appears to emerge surprisingly early in development, a finding that is in line with the AD patient results (Graham et al. 2013, Halpern et al. 2008) in that it confirms the robustness of aesthetic stability. It remains to be seen how other stages of development—or indeed how the panoply of relevant psychological factors—influence aesthetic stability.

Keywords: Aesthetics; child development; aesthetic stability; memory; art perception; memory development

Introduction

Stability in human aesthetic preference is an area that has been scarcely studied. Questions regarding stability in healthy adults, let alone other populations, have not been addressed. Increased interest in this area of study has prompted the empirical question of how stable different people are and the methodological question of whether single tests of preference can be considered reliable measures of human aesthetics. Recent research has shown that Alzheimer’s Disease (AD) patients and frontotemporal dementia (FTD) patients do not exhibit significantly different levels of stability in aesthetic judgments of many types of paintings and pictures compared to healthy matched control groups (Halpern et al., 2008; Graham et al., 2013; Halpern & O’Connor, 2013). However, this research has also shown that patients with AD perform significantly worse on an explicit memory test of the stimuli.

In attempting to further our understanding of visual perception and human cognition, researchers have developed various viewpoints and differing methodologies in studying aesthetic perception (Chatterjee, 2014). While recent research has focused on stability in elderly populations, we argue here that increasing our understanding of aesthetic stability in young children will help us develop a better understanding of stability more generally.

In previous work, Graham et al. (2013) focused on two specific questions. 1.) Whether handmade, or painted, stimuli would produce greater aesthetic stability than other images in the AD group. 2.) What the role of image content, specifically of faces, plays in patients with AD. Similarly, Halpern et al. (2008) and Halpern and O’Connor (2013) used three types of artwork (representational, abstract and quasirepresentational) in testing AD and FTD patients. Thus, one major goal in this area of research focuses on answering the question of whether representational artwork has any significant effect on patients with dementia. These earlier studies utilize stimulus effects to examine how patients suffering from AD and FTD view art. In shifting our study to aesthetic stability in child development, our focus lies on individual effects, particularly due to age, which is a relevant factor in aesthetics given the profound changes in cognition engendered by development.

In the present study, we apply the methodology of Graham et al. (2013) to preschool and early elementary school children. Therefore, while artistic content remains important in our experiment, we are mainly interested in how results vary as a function of the ages of participants.

We hypothesized two possible outcomes. The first outcome would be that stability would be higher for older children, which we would attribute to higher memory fidelity. This is because studies on memory recall and recognition for large numbers of pictures and visual objects...
have suggested that, for general pictures, memory improves with age (Hoffman & Dick, 1976; Dirks & Neisser, 1977).

The second possible outcome is that stability will be similar in all participants, which we would expect to be the case if memory is not a principal factor, as was the case in AD and FTD. Determining how and why stability could change with age will have impacts on both our understanding of aesthetics and also on development.

**Materials and Methods**

**Overview**

While past studies have examined stability regarding aesthetic preference in patients with AD and FTD versus a control group, our study focused on aesthetic stability from a developmental perspective. We performed a cross sectional study of stability in preschool and early elementary school children. The study was modeled after Graham et al. (2013). Participants were asked to rank 4 sets of 8 stimuli (ranking them numerically 1-8) based on individual aesthetic preference. Two weeks later, they were asked to repeat the same task. In addition, participants were tested on explicit memory during the follow up study prior to the aesthetic stability task.

**Participants**

Participants were recruited from four day-care facilities in Geneva, New York: Discovery’s Playground, Roots and Shoots, the Geneva Lakefront Childcare Center, and the Geneva General Child Care Center. Children were given permission to participate through consent of caregivers and through authorization of all programs involved. There were 22 participants (7 boys, 13 girls) involved in the study and all data collected was analyzed. The age of participants ranged from 3 to 9 (M = 6.2, SD = 2.04). There were no incentives given to participants.

**Stimuli**

The stimuli used included 4 sets of 8 images. The 4 sets of images were categorized as follows: “painted landscape”; “photographic landscape”; “painted portrait”; and “photographic portrait.” Images used were all of recognizable content and were painted in a representational style. The photographs that were chosen corresponded to the content of the paintings (i.e. same identity for face, or same landscape). For artworks used and specific image content, refer to Graham et al. (2013).

**Procedure**

The first part of our study consisted of participants ranking the four sets of stimuli. The sets were presented in random order, with the 8 stimuli arranged on a table in front of the participants in random order. Subjects were asked to create a ranking of the stimuli from “least favorite” to “most favorite”. Children were told that there was no time limit on the task and that there was no wrong way to rank the stimuli.

The second phase consisted of a follow up study given two weeks later. Participants were given an explicit memory task involving sixteen pairs of images with four image pairs per image category. The pairs, consisting of one image previously shown and one distractor image resembling the previously viewed stimulus (i.e. similar terrain for landscapes, same gender for faces, and same artist for paintings). Participants were asked to choose the image that they had previously been exposed to. Following the memory task, subjects were asked to repeat the rank preference task in the same manner given in the previous session two weeks prior.

**Results**

**Preference Task**

We analyzed the per item numerical change of stimulus rankings between the two sessions, which is termed the change score or aesthetic stability index. For more details on the change score, see Graham et al. (2013). The lowest score is 0 (no change) and the highest score is 4 (total change). Table 1 shows the mean change score values by image type/category. Stability as a function of stimulus categories was analyzed using two-sample t-tests. There were no significant differences between the preference stabilities of any of the four categories.

<table>
<thead>
<tr>
<th>Stimulus Category</th>
<th>Participants Change Score</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscape Paintings</td>
<td>1.57 (0.19)</td>
<td>21</td>
</tr>
<tr>
<td>Landscape Photos</td>
<td>1.87 (0.21)</td>
<td>21</td>
</tr>
<tr>
<td>Portrait Paintings</td>
<td>1.57 (0.18)</td>
<td>19</td>
</tr>
<tr>
<td>Portrait Photos</td>
<td>1.74 (0.16)</td>
<td>21</td>
</tr>
</tbody>
</table>
A regression comparing age to average change score averaged over image category showed a strong negative correlation with age ($p < 0.001$, $R^2 = 62\%$); that is, older children showed higher aesthetic stability. A $t$-test of our data with a median split (median = 6.18) revealed that older children showed higher stability (age 7-9, $M = 1.20$, SE = 0.13) than younger children (age 3-6, $M = 2.06$, SE = 0.17) with $p < 0.001$ (two-sample $t$-test) seen in Figure 1. We note that the portrait photo category displayed a lower $R^2$ value in comparison to the other three image types, which echo the results of the AD participants but do not rise to the level of significance. Interestingly, however, when separated by image type and compared by a two-sample $t$-test, older children exhibit significantly higher stability compared to younger children for photos ($p = 0.001$) but not paintings ($p = 0.459$). Table 2 shows further breakdown for $p$-values for $t$-tests testing the difference in stability of image category for older versus younger children. Gender showed no significant difference on aggregate results ($p = 0.07$, two-sample $t$-test).

Table 2 – $P$-values for $t$-tests testing the difference in stability between older and younger children for each image category.

<table>
<thead>
<tr>
<th>Image Category</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscape Paintings</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Landscape Photos</td>
<td>0.014</td>
</tr>
<tr>
<td>Portrait Paintings</td>
<td>0.019</td>
</tr>
<tr>
<td>Portrait Photos</td>
<td>0.077</td>
</tr>
</tbody>
</table>

In order to dismiss the possibility of random guessing amongst participants, a simulation of 100,000 pairs of preference orderings was conducted in order to obtain an average chance value for randomness ($M = 2.63$). This value was compared to the averaged preference values for all four image categories and by a median-split age group using a one-sample $t$-test (all $p < 0.002$), confirming that the stimuli in all preference tasks were not selected at random.

The raw ranking data for both the initial (see Figure 2) and follow up study did not show strong image biases that were shared by participants. This essentially means that there was nothing extraordinary about any one stimulus (for both paintings and photographs) in comparison to the others that would externally bias a subject’s opinion.
data and perform regressions, we find that age (R² = 60 %) is a better predictor of change score than is memory (R² = 30 %). There was no significant difference in explicit memory by gender (p = 0.87, two-sample t-test).

We tested whether participants had better recall of paintings versus photos. Results indicated that there was no significant difference between the recall rates of paintings versus photos (p = 0.21, two-sample t-test, n = 61). Results correspond with the preference task that showed that there was no significant difference between painting and photo aesthetic stability in children (p = 0.20, two-sample t-test).

Data Comparison To Control Group
We also compared our subject pool to the elderly control group observed in Graham et al. (2013). The control group consisted of 15 participants (10 female, 5 male) with an average age of 74.2 (SD = 13.2). Change scores in the preference task for the control group appeared to be flat as a function of age, as shown in Figure 4. This was confirmed by a two-tailed t-test (p = 0.908) comparing the younger portion (M = 1.70, SE = 0.153) to the older portion (M = 1.67, SE = 0.213) of the population of the control group divided via a median split. The entire elderly control groups average change score for preference was then compared to that of the younger children and older children from our study by a two-tailed t-test. The result for the older group of children was marginally significant (p = 0.014) while the results of the younger group of children was marginally insignificant (p = 0.084).

Discussion
The results of our experiment add significant understanding to the area of aesthetic perception with regard to child development. We found that older children (age > 6) had a significantly more stable aesthetic preference in comparison to younger children. We found that the older children also performed significantly better than the younger children on the explicit memory task. However, memory performance was a relatively weak predictor of stability compared to age. This finding suggests that aesthetic development may be distinct from memory development.

Previous work on memory development appears to agree with this interpretation though few studies have been
performed in this area. Hoffman and Dick (1976) studied forced-choice recognition in 3 year olds, 7 year olds, and adults following exposure to either 300 or 600 picture stimuli. The results of this experiment indicate poorer performance in younger children as the number of picture recognition choices was increased. The authors attribute this to an increase of efficient and effective processing of information with age. Another study by Dirks and Neisser (1977) involved 7, 9, 12 year olds, and adults in three tasks testing whether subjects could recognize and/or recall movements, deletions, or additions of toy objects or photos of these objects after being shown an initial set-up. The results of this experiment were that in all three categories tested, score improvements were made with an increase in age. While these two experiments do not necessarily prove that memory capacity for images increases with age during early childhood, they do suggest that our ability to organize, process, store and retrieve information pertaining to memory increases with age. While this may help us explain why older children had a significantly higher ability to recall previously seen stimuli, it does not provide a sufficient explanation for increased aesthetic stability in older children. Indeed, based on the AD results (Graham et al. 2013), explicit memory is not a key factor in stability since AD patients did poorly on the memory task but still had stable preferences.

Interpreting our results is made more challenging by the paucity of cross-sectional studies of the development of aesthetic perception, especially for preschoolers. Research conducted by Gardner (1970) studied sensitivity to painting style in a sample of 6, 8, 11, and 14 year olds. His findings indicated that the only significant difference in performance was that the 14 year olds performed better than any other group, which he attributed to increased familiarity with art and an ability to overlook the superficiality of color and content to examine technique (i.e., brush strokes). Carothers & Gardner (1979) later explored the ability of children to perceive and produce aesthetic characteristics in drawings. Their findings suggested that 7 year olds had little success both perceiving and producing aesthetic characteristics. In contrast, 10 year olds were able to perceive but not produce these characteristics and 12 year olds could both perceive and produce aesthetic characteristics in drawings. However, beyond the work of Gardner (1970) and Carothers & Gardner (1979), little research has been completed related to aesthetic perception in child development. In this context, it is surprising that the youngest children performed as well as they did in our study.

In considering the development of aesthetic perception, one could also invoke the role of novelty and familiarity. Human preference for novelty versus familiarity has prompted debate in psychology, which could play a role in our study. Park et al. (2010) conducted a study involving visual exposure to a variety of stimuli including faces, natural scenes, and geometric figures. They found that participants preferred familiarity for stimuli involving faces as opposed to stimuli involving natural scenes – where novelty was preferred. In the second session of our study, subjects were tested on the explicit memory task prior to the second preference task because if the two were reversed, the memory task would be biased and thus ineffective. Therefore, the possibility remains that because the subjects were primed with 4 image pairs per category before the preference task, paintings and photos of faces that were shown in the memory task might have been given a higher ranking due to familiarity and paintings and photos of natural scenes may have been given a lower ranking due to human tendency towards novelty in this case. However, the effects observed by Park et al. (2010) have not been confirmed in children. And moreover in our study, all participants would be expected to have the same biases with regard to novelty and familiarity since they all viewed the same images. In any case, novelty and familiarity are certainly salient to aesthetic development if for no other reason than the fact that younger children have presumably seen fewer images than older children. We therefore encourage further work in this vein.

It is also entirely possible that the aesthetic sense is its own distinct cognitive system in the brain (Leder et al. 2004). This notion could imply that the aesthetic sense has its own developmental trajectory. If this is the case, we would expect results similar to those observed here in tests performed in other modalities (e.g., music).

The area of aesthetic stability is one that can illuminate diverse questions in aesthetics, but there are many populations in which the level of aesthetic stability is still unknown. While the present study focuses on aesthetic stability in development, and previous studies have focused on stability in both healthy and impaired elderly populations, we recommend that future studies employ populations including adolescents and adults.

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References


Understanding Action-Art by Looking at Motion Dynamics

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Abstract
There are several studies from psychology and neuroscience that support a strong link between action perception, action generation and action simulation by the concept of a shared motor representation. Observing an action involuntarily and unconsciously evokes a simulation within the observer's motor system. It has been proposed that this effect is also present in processing abstract art, particularly action art. We present a mathematically inspired methodology that can be used to analyze the role of dynamic motions both during the painting process and the perceiving process of action art paintings. Data for analysis and model validation is collected by motion capture experiments and online perception studies of action art paintings. We present first results that support the validity of this approach.

Keywords: action art; robotics; dynamic motions;

Introduction
There are several results, showing that humans perceive motion and actions with a strong involvement of those brain regions that are responsible for motion and action generation. The mirror neurons located in these brain regions fire both, when an action is actively performed and when the same action is being observed. These findings support the theory, that the neural representations for action perception and action production are identical (Buxbaum, Kyle, and Menon 2005). The relation between perception and embodied action simulation also exists for static scenes (Urgesi et al. 2006) and ranges even to the degree, where the motion is implied only by a static result of this very motion. For example, (Knoblich et al. 2002) showed that the observation of a static graph sign evokes in the brain a motor simulation of the gesture, which is required to produce this graph sign.

In 2007, Freedberg and Gallese proposed that this effect of reconstructing motions by embodied simulation mechanisms will also be found when looking “at art works that are characterized by the particular gestural traces of the artist, as in Fontana and Pollock”. First empirical evidence for this was found by Taylor, Witt and Grimaldi in 2012.

Since a human possesses much more degrees of freedom than needed to move, human motions can be seen as a superposition of goal directed motions and implicit, unconscious motions. The assumption, that elements of human motions can be described this way has been applied and verified, particularly in walking and running motions (Schultz and Mombaur 2010), but also regarding emotional body language during human walking (Felis et al. 2012). If we transfer this approach to an artist, the goal-directed motions are those carried out to direct his hand (or rather a brush or tool) to the desired position, the implicit, unconscious motions can mathematically be described as an implicit solved optimal control problem with a certain cost function like maximizing stability or minimizing energy costs.

When looking at action paintings, we note, that this form of art generation is a very extreme form of this superposition model with a widely negligible goal-directed part. The whole motion can be described as the solution of one single optimal control problem with a certain set of cost functions. Therefore, it is a perfect basis to study the role of (unconscious) motion dynamics on a resulting art work. Jackson Pollock himself expressed similar thoughts when he said “The modern artist [...] is working and expressing an inner world – in other words – expressing the energy, the motion, and other inner forces” or “When you’re working out of your unconscious, figures are bound to emerge... Painting is a state of being”.

Using state-of-the-art methods from optimization and optimal control, we can give a mathematical representation of these unconscious motions that captures the “essence” of the motion by identifying cost functions that correlate with the artist’s subconscious intentions and emotional state on the one hand and the viewer’s aesthetic experience on the other hand.
Based on these results, we can generate new dynamic motions for a robotic platform, which mimic the artist’s painting style not on a kinematic (i.e. following the same trajectories) but on a higher level.

**Mathematical Background**

In order to justify our methodology, we will give a short introduction in the mathematical background concerning our models and the numerical tools for solving the resulting problems.

**Modeling Rigid Body Dynamics**

To perform mathematical computations on motion dynamics, we need to create models of the system we are looking at, in our case a human body or a robot arm. In our case, by model, we mean a physical multi-body model consisting of rigid bodies which are connected by different types of joints (prismatic or revolute). Depending on the number of bodies and joints, we end up with an certain number of degrees of freedom and a set of generalized variables \( q \) (coordinates), \( q' \) (velocities), \( q'' \) (accelerations), and \( \tau \) (joint torques). Given such a model, we can fully describe its dynamics by means of

\[
M(q)q' + N(q, q') = \tau
\]

where \( M(q) \) is the joint space inertia matrix and \( N(q, q') \) contains the generalized non-linear effects. For our purposes, a 9 DOF model of the artist’s arm was used for motion analysis and a 6 DOF model of a robot arm.

**Model-Based Motion Generation**

Once we have such a model, we can formulate our optimal control problem using \( x = [q, q', q'']^T \) as states and \( u = \tau \) as controls. The mathematical formulation of the resulting optimal control problem can be written as:

\[
\min_{x,u} \int_{t_0}^{T_f} L(t, x(t), u(t), q) dt + \Phi_M(T_f, x(T_f))
\]

subject to:

\[
\dot{x} = f(t, x(t), u(t), q)
\]

\[
g(x(t), u(t), q) \geq 0
\]

\[
r_0(x(T_0), p) + r_f(x(T_f), p) = 0
\]

All dynamic computations are included in the differential equation, the inequality accounts for the body’s limitations, such as maximum joint angles for a human arm. Within our objective function, we can account for different types of objectives: \( L \) (also called the Lagrange term) accounts for objectives that shall be evaluated over the whole time horizon, such as minimizing jerk or energy consumption and \( \Phi_M \) (also called the Mayer term) accounts for objectives that shall only be evaluated at the end of the time horizon (such as overall duration of the motion). To solve such a problem numerically, we apply a direct multiple shooting method which is implemented in the software package MUSCOD-II. For a more detailed description of the algorithm, see (Bock and Plitt 1984; Leineweber et al. 2003).

Given this formulation, we now can use different objective functions, either inspired by expert assumptions or derived from motion capture experiments to create dynamic motions for any given system that strictly correspond to these objectives.

**Model-Based Motion Analysis**

In a very similar way, we can use optimal control theory for motion analysis. Given some experimental input \( D_{\text{capture}} \) from motion capture experiments (see next chapter), we can formulate a bilevel problem that “fits” the recorded data to our model using meaningful cost functions as basis and taking into account the full rigid-body-dynamics of the modeled body – in our case the artist’s arm. The mathematical formulation is now given by

\[
\min_{x,u} \sum_{i} ||D^e(x(t_i; \alpha)) - D_{\text{motion}}(t_i)||^2
\]

resulting from a solution of

\[
\min_{x,u} \int_{t_0}^{T_f} \left[ \sum_{i=1}^{n} \alpha_i L_i(t, x(t), u(t), p) \right] dt
\]

subject to:

\[
\dot{x}(t) = f(t, x(t), u(t), p)
\]

\[
r_0(x(T_0), p) + r_f(x(T_f), p) = 0
\]

This type of problem is numerically solved using an efficient direct all-at-once approach as presented in (Hatz et al.).

The result of our computations in this case is the weighting of different base functions and the residual as a measure for the overall fit quality.

**Experiments and Data Analysis**

We performed several experiments to gain input for our computations, but also to validate our models and justify our methodology. On the one hand, we gathered information on the painting process by performing motion capture experiments, on the other hand we performed perception studies to gather information on viewers’ reactions to paintings created by different motion dynamics.

**Perception Pre-Studies**

As a first test on the role of motion dynamics for human perception of action art, we performed two pre-studies in order to find out, whether human contemplators can distinguish robot paintings from human-made paintings and
how they evaluate robot paintings created by different mathematical objective functions.

In the first study, we used a set of 9 paintings, among them seven original paintings by Jackson Pollock and two paintings created by our robot platform JacksonBot (Raschke, Mombaur and Schubert, 2011). We asked the participants – most of whom were laymen in arts and only vaguely familiar with the work of Jackson Pollock – to judge, which of the paintings were originals by Pollock and which were “fake” pictures without informing them about the robotic background of the “fake” pictures. As expected, the original paintings had a slightly higher acceptance rate, but the difference was smaller than we expected (2.74 ± 0.09 vs. 2.85 ± 0.76, on a scale of 1 - 5).

In the second study, we asked participants to perform a sorting study with ten pictures solely created by the JacksonBot platform, but with different mathematical objective functions as input. Six pictures were created using maximum overall angular velocity in the robot arm, four pictures were created using minimal angular velocity. All but one participants distinguished the different paintings perfectly. They described the paintings created by maximum angular velocity as “more dynamic”, “more aggressive” and “more unsettling”.

Motion Capture Experiments

We performed motion capture experiments with a collaborating artist, Nicole Suska. We used an XSens inertial sensor system to capture accelerations, angular velocities and the rotation matrix of the artist’s three arm segments upper arm, lower arm and hand.

![Figure 2: Our collaborating artist, Nicole Suska, during the motion capture experiment.](image)

We asked the artist to perform several different types of dynamic motions and to describe each motion and her current emotional state with different adjectives or verbs such as dynamic, angry, calm, silent, aggressive, violent, smooth, spontaneous, controlled, sad, joyful, happy, etc.

In a first step, we reconstructed the recorded motions by fitting the recorded acceleration data to our arm model in order to check for modeling deficits. As shown in figure 3, the fit quality is very good; the 6 DOF model is sufficient for motion reconstruction and motion analysis.

![Figure 3: comparison of measured (lines) and computed (dots) accelerations for a painting motion](image)

In the second step, we applied the former mentioned inverse optimal control method to search for cost functions within the recorded data. Since the computational effort of this analysis is quite high, we did not yet analyze all recorded motions. We started with a subset of motions that the artist described as aggressive/violent. For these motions, we found maximum jerk to be the highly dominant cost function. Other cost functions, such as minimal deviation of velocities did not contribute significantly to the recorded motion. As a validity check, we also analyzed one motion from the set described as calm/silent, where the maximum jerk cost function did not contribute to the motion dynamics at all. Of course, a final matching can only be given after all recorded motions have been processed this was, but these first results are consistent with our expectations.

Perception Experiments

To further investigate the reaction of contemplators to paintings created by differing motion dynamics, we created a web-based framework for perception studies. Within this framework, participants are shown different action paintings (including both original art works and robot-generated art works) and are asked to perform different tasks.

First, we investigated the way, people judge different action paintings regarding similarity in direct comparison. Therefore, participants are shown three different action paintings and are asked to arrange them on a one-dimensional axis according to their similarity (see figure 4). Additionally, participants could add keywords or tags to “explain” their decision. The resulting data set consists of (normalized) relative distances between paintings that can be used for different methods such as hierarchical clustering and tags/keywords that describe the clusters.
In the second task, people are shown multiple paintings at the same time and are asked to arrange them in clusters directly (see figure 5) and give descriptions for each cluster they form. The results from this task can be compared to the ones computed from task one and give additional information on the participants’ verbal description of the clustered images.

Finally, we ask all participants to complete a short questionnaire to check for age, previous knowledge etc. and a personality test based on items from the IPIP with a focus on openness and creativity.

Since the analysis of our motion capture experiments is still ongoing, we have not injected a lot of robotic paintings. Therefore, we cannot present statistically significant results yet. However, we can see a distinct trend that below “high level” clusters arising from e.g. color, people seem to cluster images with similar dynamic origins independently from their creator (human artist vs. robot platform).

As an accompanying measure, we created a software tool that computes a variety of different low-level image features (e.g. fractal analysis, power spectrum) for all created images and correlates these with the similarity measures / clusters from tasks 1 and 2.

**Integration and Validation**

As already explained, the main benefit of representing the motion dynamics of a human artist by identifying objective functions of the dynamical system is the independence of these objectives from a particular body. Therefore, the objectives identified by analyzing human motions can be used to create new dynamic motions for a robotic platform. This grants us a huge advantage when looking at reproducibility. For example, we can generate several different images corresponding to the exact same dynamic objectives and use our web interface to check, whether people judge them to be similar. It is possible generate paintings with differently weighted superpositions of objectives and check for (smooth or discrete) transitions in viewers’ judgements. Furthermore, we can easily adapt the “resolution” of dynamic differences between paintings (i.e. the relative weightings of different objective functions) according to results from our perception studies. This way, we can investigate interesting areas like transitions more closely than it would be possible with solely a human artist as test subject.

**Conclusion and Outlook**

A mathematical methodology for quantitative analysis of dynamic (human) motions has been introduced. We argued that this methodology can be of particular use when studying the generation and perception of action art paintings. We presented a successful motion reconstruction based on dynamic motion capture data and showed first results on the detection of objective functions in an artist’s movements using inverse optimal control theory.

We presented a framework consisting of motion analysis, perception studies and a robotic platform as validation tool. Using the robot as tool which can reliably (re)produce action paintings while providing full information on the motion dynamics involved, we plan to increase the number of paintings in our web-tool both overall and in an iterative process according to respective results.

As a long-term objective, we aim to describe correlations between motion dynamics, image features, the artists’ verbal descriptions of their intentions and the viewers’ verbal descriptions of their aesthetic experience.

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Artworks Are Attentional Engines: Normative Conventions and Evaluative Perception in the Arts

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Abstract
There is a standard skeptical concern within philosophy of art that causal explanations in psychology and neuroscience apply equally to our engagement with art that is done well and art that is done poorly and so do not contribute to our understanding of the normative dimension of artistic appreciation. This skeptical concern is often used to challenge the relevance of psychology and neuroscience to our understanding of art. I sketch a crossmodal model for perception which demonstrates that those affective processes responsible for encoding the biological and instrumental value of a stimulus play a critical productive role in perceptual processing. I argue that the ensuing model for affective perception dissolves these skeptical philosophical concerns.

Keywords: affective perception; art; attention; aesthetic judgment; artistic value; categories of art; empirical aesthetics; evaluative perception; normative conventions; philosophy of art.

Introduction
The target of this paper is a standard skeptical argument within philosophy of art about the utility of psychology and neuroscience to explanations of the normative dimension of artistic appreciation. The current debate about this issue reflects a shift in our understanding of the relationship between affect, cognition, and perception. Acquiring art critical knowledge of the productive and evaluative conventions constitutive of a particular category of art can alter my perceptual and evaluative judgments about a range of artworks (Walton, 1974; Seeley, 2013; Stokes, forthcoming). I may, as a result, come to recognize a work as formally dynamic, and consequently appraise it as aesthetically rich where before I thought of it as artistically anemic. Are these differences manifest in changes in my perceptual experience of the work, or are they a result of post-perceptual judgments about the formal properties and compositional relations within the work that I could always already see in it? This question is a variant of a more general question about evaluative perception. Are attributions of biological salience, instrumental value, or emotional significance to an object, action, or event integrated into perceptual experience, or are they the consequence of post-perceptual cognitive judgments? I sketch a model for perception below which suggests that the affective and cognitive significance of environmental stimuli are integrated into perceptual experience. I argue that this model dissolves the standard skeptical worry that research and methods from psychology and neuroscience are ill-suited to explain the normative dimension of artistic appreciation.

A Standard Philosophical Objection
There is a standard skeptical concern about the relevance of psychology and neuroscience to our understanding of appreciative judgments about artworks (Dickie, 1962; Wittgenstein, 1966). Consider the following contemporary variant of this story. Artworks can be conceptualized as communicative devices, stimuli intentionally designed to trigger perceptual, affective, and cognitive responses sufficient to enable consumers to recognize their depictive, representational, semantic, expressive, and aesthetic content. This suggests that we can treat our engagement with artworks as an information processing problem, as a question about how consumers acquire, represent, manipulate and use information encoded in the surface structure of a work to recognize its artistically salient content. Research methods from psychology and neuroscience have been fruitfully used to model the affective, perceptual, and cognitive processes that underwrite these aspects of our engagement with artworks in a range of media (see for instance Carroll, Moore, and Seeley, 2012; Carroll and Seeley, 2013a; Carroll and Seeley, 2013b; Leder, Belke, Oeberst, and Agustin 2004; Nadal, Munar, Capó, Rosselló, and Cela-Conde, 2008). However, evaluative questions germane to artistic appreciation are normative questions about whether a work has been done well or poorly, about its fit to standard conventions governing artistic practice for the relevant category of art. The skeptics’ claim is that explanations couched in terms of the causal-psychological processes that underwrite perception apply equally well to our engagement with artworks that are fit to the evaluative conventions governing production in a category of art as to those that aren’t. Therefore, causal-psychological explanations appealed to in psychology and neuroscience of art cannot be used to model the appreciative dimension of our commerce with artworks. On this account evaluative judgments are post-perceptual cognitive judgments about the fit between what is already seen in a work and the conventions that define appropriate categories of art. What differentiates the novice from the expert is that art critical knowledge enables the latter to differentially focus his or her attention in order to match shared features of a common perceptual experience of the work to productive and evaluative conventions that determine their artistic value.

This is a variant of an old bone of contention between philosophy of art and empirical aesthetics. Fechner (1876), and later Berlyne (1971) argued that the a priori, deductive...
methods of conceptual analysis employed within philosophy of art could, at best, reveal the subjective biases and individual tastes of individual critics and theorists. They argued for an empirical aesthetics from below built on the backs of averaged verbal and physiological responses culled from large groups of participants. Philosophers have responded that this would be akin to looking for rules governing the meaningfulness of expressions in a language in the averaged responses of young children. The responses gathered from participants in the target population would be beside the point in this case. What matters here is rather is the considered judgments of speakers familiar with the conventions of the language, the rules governing the use of those expressions in practice (Dickie, 1962). Similarly, what matters for understanding art is neither the averaged verbal or physiological responses of large groups of consumers, nor the psychological mechanisms underlying these responses, but rather the considered judgments of groups of experts familiar with the conventions of the language, in this case the normative conventions governing appreciative judgments about different categories of art.

**A Model for Evaluative Perception**

The central assumption of the skeptical argument is that evaluative judgments and associated valenced responses can not be modeled as an integrated part of perceptual processing. Recent research in affective neuroscience challenges this claim. Quick and dirty cognitive assessments of the biological and instrumental value of perceptual stimuli are integrated into sensory and perceptual processes via a range cortico-cortico and cortico-fugal circuits that play a constitutive role in the production of perceptual experience (Barrett and Bar, 2009; Pessoa and Adolphs, 2010). The subsequent crossmodal integration of affective and perceptual processing is a means to tag stimuli with behavioral significance, a cognitive shortcut by which memory of the affective significance of different types of stimuli in stereotyped contexts can be used to shape the content of perception relative to both the current needs and interests, and long term goals, of a perceiver. This suggests that evaluative perception is the rule in everyday perception, not the exception.

**Biased Competition and a Diagnostic Recognition Framework for Perception**

This model assigns a key computational role to affective processing in ordinary perceptual contexts. The sensory inputs to perceptual systems are replete with information. Perceptual systems are, in contrast, limited capacity processing systems. Selectivity is, therefore, a critical issue for perception. One way we solve this problem is to focus attention on minimal sets of diagnostic features, or task salient sets of sensory features, sufficient to categorize, and thereby perceptually recognize the structure, function, identity, and affordances of objects or the goals, intentions, and emotional states of other agents (see Schyns et al, 2008). Schyns and his colleagues have demonstrated that changing the way one categorizes a stimulus can alter the diagnosticity of perceptual cues and even change the way we perceive them (Schyns et al, 1998).

How do we succeed in quickly and flexibly orienting attention to diagnostic features in order to bootstrap perceptual recognition in novel, dynamic, everyday behavioral contexts? One means is perceptual salience. We easily orient attention to some features because they stand out in a crowd as brighter, more colorful, or etc. However, behaviorally salient features in the local environment are not always the most perceptually salient. Perceptual systems therefore require a mechanism for assigning salience to diagnostic features independent of perceptual salience. Biased competition models of selective attention suggest that fronto-parietal and cortico-fugal attentional networks are used to solve this problem in everyday perceptual contexts. These attentional circuits endogenously bias perception by priming the firing rates of populations of neurons in sensory systems to the expectation of diagnostic features at particular locations, enhancing the encoding of task salient features, objects, and their parts and inhibiting the perception of distracting, task irrelevant information (Desimone and Duncan, 1995).

**Biased Competition and Affective Processing**

A broad network of cortico-fugal attentional circuits facilitates the crossmodal integration of affective, sensorimotor, and unimodal perceptual information (Barrett and Bar, 2009; Duncan and Barrett, 2007; Stein et al, 2006), primes sensory processing (Desimone and Duncan, 1995), and can be interpreted to implement working memory by integrating, maintaining, and reinforcing the encoding of salient perceptual information over time (Grossberg, 1999).

The general idea is that projections from prefrontal and parietal areas associated with attention, affective perception, spatial working memory, motor planning and preparation, and object recognition to sensory cortices and the earliest stages of visual, auditory, and somatosensory processing in the thalamus facilitate the integration of sensory information into coherent representations of task salient aspects of the local environment and account for the influence categorization processing and cue diagnosticity in perception.

A rough and ready model for evaluative perception emerges from the contributions orbitofrontal cortex (OFC) makes to this model of perception. Medial OFC plays a critical role in estimating the value of a stimulus and encoding this information in autonomic and visceromotor bodily responses that prepare the perceiver to act. Lateral OFC integrates this bodily encoded information about the biological, instrumental, and emotional significance of a stimulus with information from multiple sensory modalities, including fine grained visual information. These regions of OFC are, in turn, reciprocally connected to sensory cortices and so contribute to the attentional circuits that enhance and inhibit the perceptual encoding of diagnostic information. The net result is a crossmodally integrated, contextually sensitive perceptual representation of the behavioral and
affective significance, or value, of target objects (see Barrett and Bar, 2009; Duncan and Barrett, 2007).

There is an intuitive plausibility to this story. Knowledge of the structure, function, and identity of objects, events, and actions is derived from our external sensory-perceptual experience of the world. However, the sight, sound, taste, smell, and touch of objects and events are always also associated with contextually modulated changes in breathing, heart rate, muscle tension, visceromotor, and vestibular responses. We experience these autonomic and visceromotor responses as levels of arousal, pleasure, and discomfort that encode the perceived value of a stimulus and determine the diagnosticity of its features in a context. Our categorical knowledge and episodic memory of objects and events in the world is encoded as sensorimotor patterns that encompass all of these variables (Barrett & Bar, 2009). When perceptual systems call on knowledge encoded in memory to interpret, modify, and modulate sensory signals, we should, therefore, expect that information about the affective-evaluative significance of stimuli in a context will compliment the role played by declarative knowledge of the structure, function and affordances of objects and object types.

Affective Perception and the Amygdala

The model for affective perception articulated here contrasts with the standard model for affective perception in the literature (Pessoa & Adolphs, 2010). The standard model rests on an assumption that emotions are direct, unmediated responses to a special class of environmental stimuli, or that affective perception generates automatic affective responses that function independently of, and prior to, cortical influences on perception associated with cognitive processes like attention and categorization. There are three putative sources of evidential support for the standard model: anatomical evidence of a "low road" subcortical pathway in rodents; behavioral evidence of fast, non-conscious perceptual responses to coarse-grained, low spatial frequency, emotion laden stimuli; and the observation that it would be highly adaptive to have a capacity for fast, automatic, perceptual processing of biologically significant stimuli in a dense, noisy, and often dangerous environment. However, current neuroanatomical evidence does not support the idea of a homologous subcortical pathway in primates (Pessoa and Adolphs, 2010), the time scale of responses in basic-level categorization tasks (19-67ms) is analogous to the time scale for discrimination of stimulus valence (80-150ms) (Green and Oliva, 2009; Kawasaki, Kaufman, Damasio, Damasio, Gronner, Bakken, Hori, Howard, Adolphs, 2001), and reaction times for the detection of fearful faces among distractors in a patient dependent on cortical processing because of amygdala lesions are within the normal range (Tsuchiya, Moradi, Felsen, Yamazaki & Adolphs, 2009). These results support the idea that affective responses to emotion laden stimuli involve feedback from a fast, feedforward cortical sweep which yields a coarse, basic level categorization of the stimulus that encodes its biological salience.

Earlier research by Pessoa, Kastner, and Ungerleider (2002) supports this interpretation of affective perception. Pessoa and his colleagues have demonstrated that affective responses to emotion-laden stimuli in moderately high attentional load tasks depend on the availability of attentional resources. For instance, covertly attending to sets of eccentrically presented rectangular bars in a same/different orientation discrimination task eliminated amygdala responses to photographs of fearful and happy faces in normal participants, even when they were fixating on the center of the facial expression. Analogous results have been demonstrated for the perception of basic sensory features, pictures, and words (Rees, Russell, Frith, and Driver, 1999; Rees, Frith, and Lavie, 1997). These results demonstrate that affective perception depends upon the same top down cognitive processes as object recognition in ordinary contexts, and that top-down feedback generated by a fast cortical sweep through the visual system is alone sufficient to account for affective responses to visual stimuli (Pessoa and Adolphs, 2010). What's the take home message for the current discussion? These results demonstrate that the outputs of affective processes responsible for encoding the value of a stimulus to an organism are integrated with categorical knowledge concerning its structure, function, and identity in perceptual experience.

Revisiting the Standard Objection

Artists' productive and formal-compositional strategies in the fine arts can be interpreted as devices for culling diagnostic cues from structured explorations of the content of perceptual experience and rendering them in a medium, e.g. color studies, maquettes, story boards, and dailies in film and video production. The constraints on the development of these formal-compositional strategies are the intended content of an artist's works and the range of productive and evaluative conventions that define artistic practices within his or her community. These productive and evaluative conventions define categories of art. Categories of art, in turn, determine the artistic salience, and thereby perceptual diagnosticity, of the features of a work. For instance, recognizing that a Rodin or Degas belongs to the category Impressionist sculpture, say by noting qualitative aspects of the surface articulation of its forms, is a cue that the artistically salient expressive features of the work lie in the way the muscles have been articulated across the joints of the figure in order to produce the lifelike, spontaneous dynamics of its pose. Categorical knowledge of these productive conventions therefore determine the evaluative conventions a viewer brings to bear in appraisals of whether it has been done well or poorly, which, in turn, determines the modes of attention that shape a viewer's perceptual experience of the work.

The neurophysiological evidence discussed above demonstrates that knowledge of the productive and evaluative conventions that define different categories of art plays a constitutive role in the way consumers perceive an artwork. Evaluative judgments about art, judgments of fit
between a work and normative conventions governing production and appraisal for a category of art, are therefore built-in to the architecture of perception. They are productive constraints that determine what we perceive in a work and how we perceive it. This entails that the standard skeptical argument about the utility of psychology and neuroscience to explanations of artistic appreciation art is not sound.

This should come as no surprise. Consider, for instance, a familiar philosophical thought experiment involving Picasso's Guernica and a fictional class of bas reliefs called Guernicas (Walton, 1970). Guernicas have the same compositional and representational content as Picasso's Guernica, albeit expressed in low relief. The rub is that this caveat entails that the expressive dynamic features Guernicas share with Guernica emerge from different productive practices and different kinds of non-aesthetic formal features. Guernica is a Cubist painting. It's dynamic spatial properties are carried in the fractured juxtaposition of highly contrastive, two-dimensional, black and white forms. This productive strategy produces a short depth of field, collapsing the depicted figures into one another in a chaotic composition. Guernicas achieve the same perceptual effects by articulating the formal-compositional structure of the work in low relief. The formal features diagnostic for the jarring expressive quality of the Guernicas are therefore missing from the flat composition of Guernica, and vice versa.

The community familiar with the category of art [GUERNICAS], so the story goes, would experience the flatness of Guernica as oddly inappropriate, and perhaps even calm and serene, because their perceptual expectations about the work would have been thwarted. Guernica is simply missing critical depth cues that are diagnostic for a Guernica's dynamic features. We don't have to work too hard to imagine analogously that our community would experience the monochromatic grey-brown surface of the Guernicas as dull and lifeless. The point is that the perceptual features of these works are out of synch with their content when they are categorized incorrectly; the attentional strategies appropriate to the attributed category of art will therefore misfire; perceptual expectations will be unsatisfied; and a viewer’s perceptual engagement with the works will fail to match to the information demands that drive it. My expectation is that these factors will lead an unresolved perceptual tension embodying a negative evaluation of the work as ineffective.

Of course the real story about a viewer’s engagement with (the) Guernicas would likely be more nuanced. Violating conventions is a standard productive practice for articulating the content of an artwork. Likewise, puzzling out the purpose of category violations in art is a standard evaluative practice. The low spatial frequency information diagnostic for the formal-compositional structure of these works is roughly the same and would suffice for educated viewers to recognize them as exemplars of the kind of work whose artistic salience lies in the dynamic articulation of their content. When perceptual expectations fail, we would expect these viewers to mobilize knowledge of the formal-compositional strategies appropriate to Cubist painting and bas relief to puzzle out how the artist had intended to articulate the dynamic features of Picasso's Guernica (or the Guernicas). If the works are successful, the model for perception that I have proposed suggests that these consumers would come to experience their dynamic qualities in a novel way by virtue of the deployment of appreciative strategies culled from their declarative knowledge of avant-garde methods, Cubist painting, and bas relief.

All of these aspects of a viewer’s potential engagement with a work can be accommodated by the crossmodal diagnostic recognition framework for perception articulated above. Critically, the model demonstrates that comparisons between the work and conventions governing evaluations of whether it has been done well or poorly will play a productive role in perceptual experience that can be explained neurophysiologically. Therefore, contrary to standard skeptical arguments against the utility of psychology and neuroscience to explanations of the normative dimension of artistic appreciation, the model has the capacity to explain differences in our experience of works that have been done well from those that have been done poorly, and so can contribute to explanations of the normative dimension of our appreciative commerce with artworks.

References


Expertise and Memory for Art: An EEG Study

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Abstract
Experimental aesthetics has shown significant differences in aesthetic appreciation as a function of people’s experience and knowledge of art. In this study we aimed to identify specific ERP patterns related to encoding and retrieval of art information, and to ascertain how such patterns are modulated by art expertise. Our results revealed differences between participants as a function of art knowledge in the C1-P1 component during a recognition task. This component has been linked to modulation of attention by attentional or cognitive load, which suggests that participants in the high knowledge group were retrieving more information from memory in order to decide whether they recognized the artworks or not.

Keywords: art, expertise, memory, implicit learning, EEG, ERP.

Introduction
The cognitive and affective processes underlying art appreciation, as well as their neural correlates, have been intensely investigated in the last two decades (Chatterjee, 2011). One of the most consistent findings is that art experts and laypeople engage with art in clearly different ways (Winston & Cupchik, 1992). It is usually believed that the effect of expertise is related to peculiarities in experts’ perceptual processes and knowledge organization. However, most studies have been carried out with small numbers of stimuli or participants. In addition, many of the stimuli in previous work have been well-known artworks. This has made it almost impossible to separate the impact of expertise from the influence of familiarity and recognition. In an earlier work we examined the electrophysiological response in a sample of art experts and a sample of nonexperts while they freely viewed a large number of unfamiliar artworks (Pang et al., 2013). We found that both groups differed in the amplitude of the P3b component. This is usually associated with the retrieval of knowledge from long-term memory. Thus, in the present study we aimed to identify specific ERP patterns related to encoding and retrieval of art information, and to ascertain how such patterns are modulated by art expertise.

Methods
Participants were screened for expertise based on a recently developed questionnaire (Pang et al., 2013), which measures expertise based on art education, activities, and interest. It has proved to be highly reliable in measuring this domain (Cronbach’s alpha = .9). The 17 highest (mean score = 44.56, SD = 4.52 ) and 17 lowest (mean score = 30.0, SD= 6.09) scorers on this questionnaire were invited to participate in an EEG recording session. As a part of the ERP testing, participants first took part in an encoding task. They were asked to respond to two questions for each of the 100 unfamiliar paintings shown: “Is it beautiful?” and “Is it familiar?” Because this was an incidental learning task, they were not told that there would be a subsequent recognition phase. After a short distracter activity designed to prevent rehearsal in working memory, participants were asked to perform a recognition task. Here, they were required to determine whether each of the paintings they were shown had been presented in the first phase. Participants were shown 200 paintings, 100 of which were old and 100 were new.

Results and Discussion
Our analysis indicated no significant differences in brain activity between the groups during the encoding session. During the recognition task, however, analyses indicated that high and low scorers on the questionnaire differed in the amplitude of a negative peak 50-100ms after stimulus onset and the amplitude of a positive peak 170-250ms after stimulus onset (Figure 1).
Both of these differences appeared in midline, left hemisphere, and right hemisphere occipital electrodes. This component was identified as a C1-P1 complex based on the negative peaks latency at around 80ms and the positive peak after, both the peaks with a parietal-occipital scalp distribution (Figure 2).

This C1-P1 component has been linked to modulation of attention owing to cognitive load. Thus, it is possible that high experts required more attentional resources to recognize paintings. At retrieval, while it would suffice for the low experts to look for simple cues such as colors, symmetry, brightness, the meaning of the painting, depicted objects and so on; high experts would require more attention and cognitive resources to stylistically evaluate the painting again and determine whether the same stylistic information was presented earlier.

References
How Big Is That Supernova In the Window?¹

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Abstract

More than ever before, people have become consumers of data. How this shift in the way information is communicated and received affects perception, enjoyment, and comprehension of images is still an open question. This study examined one aspect of this digital age: perceptions of astronomical images and their labels, on mobile platforms. Participants were \( n = 2183 \) respondents to an online survey, and two focus groups (\( n = 12 \) astrophysicists; \( n = 11 \) lay public). Results indicated that the size and quality of the images on the mobile devices affected label comprehension and engagement. A label format question using a leading question was significantly preferred to a format written around a fun fact. Results inform how the size and the quality of the images on mobile platforms, and their accompanying text, need to be considered for astronomical images.

Keywords: astronomical imagery; mobile technology; expert-novice differences

Background

Using the Internet, people have become consumers of data more than ever before. How this shift in the way information is communicated and received affects perception, enjoyment, and comprehension of images is still an open question. This study examined one aspect of our digital age, using astronomical images and their labels, on mobile platforms. Astronomical images are inherently digital, in that many are created from sources not detectable by the human eye, such as radio to infrared electromagnetic radiation and X-ray data.

With regard to aesthetics, a number of studies have explored how individuals visually process art, how the information accompanying art influences perception, and how experts differ from novices in the perception of art (e.g., Russell, 2003; Silvia, 2006; Locher, Smith, & Smith, 2001). In a previous study (Smith et al., 2011), color, explanation, and scale affected the perception and comprehension of astronomical imagery for both experts and novices.

Research is needed that establishes how both experts and novices perceive images across digital platforms, and what types of information enhance the appreciation and understanding of these images on digital platforms. This empirical study addressed these issues by systematically examining the relationship between information and user comprehension across digital platforms. The research questions were:

1. How engaging are astronomical images across different types of mobile platforms?
2. What types of information most enhance the comprehension of astronomical images across different mobile platforms?

Method, Materials, and Procedure

Participants were a convenience sample of \( n = 2,183 \) respondents to an online survey created for the study, and two focus groups (\( n = 12 \) astrophysicists; \( n = 11 \) lay public). Online participants were randomly assigned to view 1 of 12 astronomical images on their mobile device, and compare two label formats for the assigned image, one with a leading question and one with a “fun fact” about what the image was illustrating. Using iPhones and iPads, focus group

¹A full report on this study, entitled “Examining Perceptions Of Astronomy Images Across Mobile Platforms,” can be found in the Journal of Science Communication (JCOM) at http://jcom.sissa.it/archive/13/02/JCOM_1302_2014_A01. Any duplication of information in this proceedings is provided with permission of the editors of JCOM.
participants compared a subset of the images and the two label formats.

Results and Discussion
The results indicated that the size and quality of the images on the mobile devices affected label comprehension, aesthetic perception, and engagement. When focus groups participants were permitted to engage in comparisons across mobile platforms, size of the mobile platform mattered. Bigger was better.

Results from the online participants supported Locher, Smith, and Smith’s (2001) concept of facsimile accommodation in that, in the absence of a comparison, participants tended to adapt to the mobile platform size. However, comments indicated that the size and resolution of the images on mobile phones were problematic.

Overall, there were few expert/non-expert differences. For the labels, the leading question label format was significantly preferred to the fun fact both for the online participants and for the focus group participants.

Results inform how the size and the quality of the images on mobile platforms, as well as the accompanying text, need to be considered for astronomical images, such that the public is engaged, informed, and eager for more.

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References


Looking Back by Looking into the Future – The Role of Anticipation and Trend Effects in Retrospective Judgments of Musical Excitement

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Abstract

When we judge experiences retrospectively, we need to temporally integrate the single elements into an overall evaluation. In our study, we compared momentary and retrospective excitement judgments of seven musical pieces. Results reveal that the mean momentary judgments together with the linear trend of the latter half of the pieces were found to be significant predictors of retrospective judgments. It could also be shown, that the trend effect reinforces anticipation measured by a decreased response time of the momentary judgments. It therefore can be stated that retrospective judgments of musical excitement are not only the sum of the single elements of an actual experience but are also supposed to depend on “remembered future” – anticipated future states of an experience.

Keywords: Peak-end rule; trend effect, anticipation, music cognition.

Introduction

When a person is moved to say or feel: “How beautiful that is!” we may call that an aesthetic experience (Hevner, 1937). From a psychological perspective, the appreciation of art can be considered a mental function, a psychological process that is determined by differences in personality, training, capacity, physique, etc. (ibid.). Given that fact, under which circumstances do aesthetic responses to music occur? Fechner (1876) points out that humans have an inherent need for changes of stimulation. An aesthetic experience therefore can be the result of a contrast between something beautiful and something less beautiful (principle of aesthetic contrast). A pause in a resounding music for example may evoke a strong impression of silence due to the contrast with the previous noise. The importance of temporal dynamics is also highlighted by Meyer (1956) who states that aesthetic responses in music are aroused by inhibition of tendencies [creation of tension] and eventual resolution (see also Madsen, 1993).

It becomes obvious that temporal changes creating musical tension or excitement are essential parts of aesthetic appreciation of music. Musical tension further plays an important role in the emotional aspects of musical listening, since it is strongly linked to processes such as expectancy build-up, violation or fulfilment of expectancies (Huron, 2007; Lehne et al., 2013). According to Huron (2007), musical expectancy can be related to biological functions rewarding correct anticipations of future events. Referring to these mechanisms, he proposes a model of human emotional responses related to imagination, tension, prediction, reaction, and appraisal. In this book, Huron also reviews methods measuring anticipation, for example the reaction time method. It has been shown in the context of melodic expectation that accurate expectation facilitates perception which again results in a faster response (Aarden, 2002). According to that, a short delay between stimulus and response is correlated with high expectation (ibid.).

In the discussion on temporal dynamics and the aesthetics of musical listening, the question arises when do we judge a whole piece as beautiful or even call it our favorite one? When we look back at a (past) musical experience, which of its elements are used to establish a retrospective judgment? Is an overall judgment only the sum of the momentary impressions? In other research areas, the relationship between momentary and retrospective judgments has already been in the focus of researchers’ attention. Well-known and pervasive phenomena in cognitive psychology are the primacy and recency effect which describe a higher weighting of the first and final portion of a stimulus when a retrospective judgment is made (e.g. Anderson, 1965, Winograd & Soloway, 1985). Kahneman et al. (1993) could show that, beside the recency effect, the most extreme affect (peak) experienced during the episode is decisive for the retrospective evaluation of an affective experience. Several studies revealed that an unweighted combination of both factors could well explain the variance of the retrospective judgments. The authors established their “peak-end rule” in the course of investigations on pain perception, but it could also be confirmed for other kinds of affective experiences. Rozin, Rozin and Goldberg (2004) for example investigated the peak-end rule in the context of music perception. The results of this study show that retrospective judgments of affective intensity are governed by the peak, the last moment, and moments that are more emotionally intense than immediately previous moments. The peak however proved to be the strongest predictor of remembered affect. A “peak effect” could also be demonstrated by Sloboda and Lehmann (2001) who recorded moment-to-moment ratings as well as post-performance evaluations of musical expressiveness.

Another factor supposedly influencing retrospective judgments is the linear trend of an experience. Many studies
in the field of decision-making indicate that people typically prefer sequences that improve over time to both sequences that do not improve and those that worsen (Loewenstein & Prelec, 1993). Varey and Kahneman (1990) studied preferences over short-term streams of discomfort (duration: 2-20 min), and observed that participants strongly favored streams of decreasing discomfort, even when the overall sum of discomfort over the interval was the same. The preference for improvement in the trend of experience obviously depends not only on the amount of improvement but also on the speed ("velocity") with which the improvement happens over time. As reported by Ariely and Carmon (2000), summary assessments partly reflect inferences about future states. Hence, the trend of an experience may convey information about future states of an experience and therefore enhances anticipation. This is particularly valid for continuous experiences rather than for those consisting of multiple discrete or segmented experiences (ibid). Another study done by Ariely (1998), however, revealed that retrospective evaluations of painful experiences are not influenced by the intensity trend during the whole experience, but by the trend during the latter half of the experience.

In their experiments on music perception, Rozin et al. (2004) also found an impact of the trend on remembered affective intensity. Taking also the effect of peak and end into account, the authors propose a model which describes a non-linear relationship between momentary and retrospective judgments. Thereby, they assume that on-line experiences fade logarithmically in memory. In this model, the remembered intensity (RI) is represented as a weighted sum of n momentary intensities (MI), in which each momentary impression is weighted differently according to its recency, intensity, and slope coefficient. In mathematical symbols, the final formula Rozin et al. (2004) propose is:

$$ RI \sim \sum \left[ ML_n \times \ln(t_r) \times \ln(ML) \times (ML_n - ML_{n-1}) \right] $$

As mentioned above, Rozin et al. introduced this model to predict remembered affective intensity based on the single momentary impressions. It is thus worth investigating the validity of the model also for other dimensions, e.g. musical excitement which is considered an important factor in the aesthetic experience of music. The model was moreover established in the context of well-known pieces supposedly being familiar to the participants. It can therefore be assumed that participants already built up musical expectations due to prior listening of the pieces. Furthermore, a high familiarity of a piece is likely to enable the listener to recall most of its single elements when it comes to a retrospective judgment.

In summary, there is a need to investigate if the model may also be applied to predict remembered affective intensity of pieces which are not known to the participants. Therefore, the aim of the following study is to investigate the peak-end rule, the trend effect, and the validity of the model proposed by Rozin et al. (2004) in the context of the momentary and retrospective judgments of musical excitement. Additionally, we study if the linear trend of an experience, as in other areas discussed above, reinforces the anticipation of future states of a musical piece.

Method

Participants
49 listeners aged 20 to 57 years (9 women, 40 men) took part in this experiment conducted at Düsseldorf University of Applied Sciences. They were recruited via the university e-mail list and received 5 euros for their participation in the experiment. They were randomly assigned to the experimental (25 participants) and control group (24 participants). The participants were naive with respect to the hypotheses under test.

Stimuli
7 musical pieces (ambient style) were composed exclusively for the experiment. This was done to ensure that none of the participants would anticipate and memorize the piece based on prior experience with it. Furthermore, each of the pieces had one single presumed peak moment primarily caused by an increase in loudness. Modifying acoustical features in a musical piece is one of the strategies to arouse emotions in listeners by causing a brain stem reflex (Juslin, 2013). The presumed survival value of this reflex is focusing attention on potentially important changes or events in the close environment (ibid). One of the main advantages of this technique is that musical excitement of these pieces can be described as a function of loudness. Besides, the delay between loudness function and excitement judgment can be used as a measure of response time, and thus for anticipation.

The pieces ranged in duration from 62 to 90 seconds to ensure the influence of long-term memory and attention effects. Since the position of the presumed peak was hypothesized to have an effect on the overall evaluation, the peak position was varied in three steps within the composition process. The peak could occur at the beginning (peak position 1), the middle (peak position 2), and toward the ending (peak position 3) of the piece. Moreover, also the end was varied with regard to its presumed excitement.

Apparatus
The experiment took place in an acoustically treated sound studio at Düsseldorf University of Applied Sciences where the pieces were played via active stereo loudspeakers (Genelec 1031A). The recordings were played from a computer using an ADAT Sound Interface with 24-bit DA converters (RME Fireface). The playback volume was adjusted to a comfortable level and kept constant for all participants. The psychoacoustic loudness (ISO 532) of the pieces was measured at the listeners' position with a binaural recording system (HMS II with BEQ II-Frontend). For the experiment, a special computer user interface was developed in-house by using HTML5 and J-Query Mobile.
Procedure
The participants were seated on a comfortable chair in the sweet spot of both speakers. Their task was to rate the excitement of the seven pieces using a continuous slider ranging from calming to exciting (German: beruhigend - aufregend). This slider was displayed on a computer screen and set to middle position before each trial. The experimental group was requested to indicate momentary judgments by continuously adjusting the slider over the course of the music presentation. The temporal changes were recorded with a sampling rate of 4 Hz. Additionally, the participants had to rate the pieces retrospectively directly after listening to them.

Furthermore, it was hypothesized that the mere process of real-time judging could modulate attention processes, and therefore could affect the overall judgment (Feldman & Lynch, 1988). So, a control group was established which was asked to listen to the musical pieces and only judge them retrospectively. The different pieces were presented in randomized order to nullify potential order effects.

Data analyses
The main objective of this study was to investigate which features of the momentary judgments significantly contribute to the retrospective judgments. Therefore, correlation and regression analyses were computed. The calculation of the trend is based on a regression analysis with the independent variable time (time regression analysis). Moreover, two-tailed t-tests were calculated to test for significant differences between overall judgments and different "strategies" hypothesized to govern them ("averaging", recency effect). If not reported otherwise, the significance level was set at $\alpha = .05$. Since the participants needed time to put themselves into the scene and establish a judgment, the first five seconds of the momentary judgments were discarded. Furthermore, the judgments performed by the listeners were compared with the psychoacoustical loudness (ISO 532) of the pieces using correlation and regression analyses. As described above, the musical pieces were composed with one single presumed peak moment primarily caused by an increase in loudness. It was assumed that both functions – loudness over time and momentary excitement judgments – are time-shifted due to a delayed response of the participants. Thus, the normalized cross-covariance function was calculated. At zero-lag, this function corresponds to the correlation coefficient and therefore can be compared with common correlation values in literature (Chatfield, 2004). As already mentioned, the delay between both functions was used as measure for anticipation.

Results

Momentary Judgments
Figure 1 shows the averaged experience profiles of the momentary judgments for each piece including their linear trends (dotted lines) and the averaged retrospective judgments of the experimental group (single dots). It becomes obvious that the intended temporary structure with one distinct peak only occurs in 4 of 7 pieces. Three examples seem to have two peaks (No. 1, 5, 7).

![Figure 4: Experience profiles of the seven musical pieces](image)

Retrospective Judgments
Table 1 shows the mean retrospective judgments and the features of the temporal experiences hypothesized to have an effect on them. "Average" denotes the mean values of the momentary experiences, averaged across participants. For the presumed factors "peak" and "trend" two different variables were established. "Peak (individual)" represents the averaged values for the individual maxima of each listener which may occur in different parts of the musical piece. In contrast, "peak (curve)" shows the maximum of the averaged experience profile for each piece. The same distinction applies to "trend" where two variables were calculated with different orders regarding both calculation steps (linear regression over time & averaging). This means, trend (curve) represents the correlation coefficient of the averaged experience profiles over time, whereas trend (ind.) indicates the averaged correlations of the individual profiles over time.
Table 1: Momentary and Retrospective Judgments - All Variables

<table>
<thead>
<tr>
<th>Piece</th>
<th>Retro No.</th>
<th>Average</th>
<th>Peak</th>
<th>End</th>
<th>Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exp. Cit.</td>
<td>moment.</td>
<td>ind.</td>
<td>curve</td>
<td>ind.</td>
</tr>
<tr>
<td>1</td>
<td>29.7</td>
<td>35.8</td>
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<tr>
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</tr>
<tr>
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</tr>
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<td>60.8</td>
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<td>5</td>
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<td>42.8</td>
<td>37.4</td>
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</tr>
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<td>26.4</td>
<td>27.8</td>
<td>53.8</td>
<td>41.3</td>
</tr>
</tbody>
</table>

Comparison across experimental groups

At first, retrospective judgments of both groups (Table 1, column 2 and 3) were compared to investigate if making momentary judgments influenced the overall evaluation. Therefore, a series of t-tests was calculated. Bonferroni's correction for multiple comparisons was applied (p = .05/7 = .007). The t-tests for each item did not reveal any significant differences between the groups (.19 < p < .87). A detailed analysis, however, indicates that in 5 of the 7 cases the retrospective judgments of the control group are higher than in the experimental group. Two explanations can account for this phenomenon. First, it may be assumed that the effect of the peak is higher for the control than for the experimental group. This hypothesis is supported by a higher correlation of the retrospective judgments of the control group and the peak ratings (curve) (r = .57) compared to the retrospective judgments of the experimental group (r = .05). An alternative explanation could be a central tendency bias in the control group which led to judgments closer to the center of the scale (.50).

Prediction of retrospective evaluations

In the next step, paired t-tests were calculated to compare the retrospective judgments (experimental group) with the averaged momentary judgments (Table 1, column 4). One can observe significant differences in 3 of the 7 cases before, and in 1 of the 7 cases after applying the Bonferroni correction (.00 < p < .50).

In order to explore the factors which are most appropriate to predict the retrospective judgments for all musical pieces, a multiple regression was calculated with the listed features of the momentary judgments considered as independent variables (see Table 2). Both step-forward and step-backward regression analyses reveal the two highly significant predictors average and trend (ind., 2. half) which are shown in Table 2.

The R² obtained for this regression model equals .959. For no-intercept-models, this measure indicates the proportion of the variability in the dependent variable about the origin explained by regression and therefore cannot be compared to R² for models that include an intercept. Thus, an intercept model with the same predictors was also calculated to compare the R² with existing literature. In this case, the explained variance of the model is lower (R² = .88).

Table 2: Regression coefficients – No intercept model

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>β</td>
<td></td>
</tr>
<tr>
<td>Average (moment.)</td>
<td>.96</td>
<td>.03</td>
<td>1.04</td>
<td>30.35</td>
</tr>
<tr>
<td>Trend (ind., 2. half)</td>
<td>10.46</td>
<td>3.27</td>
<td>.11</td>
<td>3.20</td>
</tr>
</tbody>
</table>

In contrast, the model Rozin et al. (2004) propose does not receive empirical support from this study. The squared correlation coefficient R² between the RI and the retrospective judgments is only .12. Also the combination of peak and end is not the best possible model. However, it still explains 76% (R² = .758 for an intercept model and R² = .992 for a no intercept model) of the data, if the end receives a higher weighting than the peak (ind.) (β(peak) = .32 and β(end) = .68 for the no intercept model). It is obvious, that the peak “marks” a trend depending on its position (see Figure 1, e.g. pieces 3 and 6). Hence, an interaction variable was computed as the product of peak (ind.) and its position (begin [-1], middle [0], end [1]). The correlation r between this term and trend (ind.) is .94 (p < .01), and the correlation with trend (ind., 2. half) is r = .89 (p < .01). Thus, it can be stated that the peak still has an (indirect) impact on the retrospective judgments.

Loudness analysis of the musical pieces

First, it was analyzed how loudness changes over time contribute to the variability of the momentary excitement judgments. As already described above, the normalized cross-covariance function (NCCVF) was calculated instead of the correlation coefficient because of the presumed time-shift of loudness function and the response of the test persons. In all cases, significant correlations (maxima of the cross-covariance function) could be detected within a delay of 0 to 5 seconds between stimulus and response (.51 < max(NCCVF) < .80). The correlation values confirm that momentary judgments of the pieces, as intended, are strongly related to loudness changes. This is also illustrated in Figure 2 which shows the loudness curve and the averaged excitement judgments of piece no. 4 (max(NCCVF) = .76, Δt = 3.75 sec).
In the next step, it was analyzed how the linear trend of the perceived excitement fosters the anticipation of the piece measured by the delay time between loudness and excitement judgment. Correlation analyses reveal a highly significant correlation between response time and trend (ind., absolute values) of $r = -0.93$ ($p < 0.01$). This measure indeed suggests that the magnitude of the trend enhances the subjective anticipation which again decreases the delay of the response.

**Discussion**

The results illustrate that retrospective judgments of musical excitement cannot be explained only by the average of the single momentary experiences. The trend effect indicates that the look back in the past is also affected by a look into the future and a suspicion of how the experience will develop over time. One can state that participants “remember the future” when performing retrospective judgments. This effect also stresses the meaning of expectation and anticipation in the course of music perception. As already pointed out by Rozin et al. (2004), the trend effect suggests that a phrase, movement, piece, or entire concert needs affective valleys just as it needs affective peaks. Without low points to provide contrast, high points would not have the remembered effect that they actually have. This again corresponds with Fechner’s principle of aesthetic contrast. The effect of the trend in this study becomes obvious not only by analyzing the judgments themselves but also by the fact that the trend apparently enhances anticipation measured by a decreased response time of the momentary judgments.

In this study, the trend of the 2nd half was an appropriate predictor of retrospective judgments as against the trend of the whole pieces. Thus, it may be assumed that participants primarily remember latter parts of the piece and “use” them to predict the potential future development of the piece. This is in contrast to findings on momentary and retrospective judgments of soundscapes where similar stimuli in terms of duration and temporal structure were investigated and where the trend of the whole stimulus was found to be a significant predictor (Steffens & Guastavino, in press). The discrepancy between these findings could possibly be explained by different “degrees” of eventfulness of the stimuli. In the study on soundscapes fairly constant, “uneventful” sounds, e.g. traffic noise, were used until a certain peak occurred, whereas the eventfulness of the music used in this experiment can be considered to be higher, e.g. due to harmonic and melodic changes. The effect investigated in this study can be related to the concept of “dynamic expectations” proposed by Huron (2006) which are shaped by immediate experience and linked to short-term memory processes. Since the capacity of the short-term memory is hypothesized to be limited to certain number of events (e.g. Cowan, 2001), this also may explain why only the latter half was “used” by the participants to build up an expectation about the development of the piece.

The peak-end rule was not the best possible model in this study. The analysis of the momentary judgments shows that in some examples the intended peak did not significantly contrast with the rest of the piece. It therefore can be interpreted that the peak did not evoke the same kind of emotion, and thus does not receive the same weighting compared to other studies on the peak-end rule (e.g. pain perception). This may also be a reason why the formula proposed by Rozin et al. (2004) did not turn out to be a significant prediction model. One has also to consider that the model was suggested to explain affective intensity instead of excitement judgments. Another factor may be the familiarity of the musical pieces in the study of Rozin et al., which could have helped the listener to memorize the whole piece while making overall judgments. This again could have led to a more analytical judgment taking into account all single parts of the pieces. In contrast, in this study the participants could have performed rather heuristic judgments applying simple “rules of thumb”. Performing momentary judgments could moreover have reinforced the listeners to establish a kind of “graphic average” by remembering the slider positions.

Moreover, it could be observed that in 5 of 7 cases, participants of the control group performed higher excitement judgments than the participants of the experimental group. Two possible explanations are addressed: First, the impact of the peak may be higher for the control than for the experimental group. This may be due to the fact that participants of the control group focused on listening to the music (not on performing momentary judgments), which could have led to slightly different attention processes. Second, a central tendency bias in the control group could have led to judgments closer to the center of the scale (50). This could be due to an increased uncertainty in this group how to establish an “appropriate” judgment in contrast to the experimental group which could have remembered the slider positions in the course of the momentary judgments.
Conclusion
The study reveals that retrospective judgments of musical excitement are not only the sum of the single elements of an actual experience but are also supposed to depend on “remembered future” – anticipated future states of an experience suggested by its linear trend. The accuracy of the participants’ prediction is further indicated by a negative correlation between response time and absolute magnitude of the trend. Thus, an increased trend supposedly indicating a distinct development reinforces the anticipation of the musical experience. Further research efforts will focus on the relationship between anticipation and pleasantness of musical pieces in momentary and retrospective judgments. This includes the role of surprise and tension in the musical experience, but also the meaning of expectability specifically in the context of aesthetic judgments.

Acknowledgments
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References
Effects of Lecture and Painting Elaboration on the Judgment of Abstract Paintings

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Abstract
This study investigated the influence of information on ratings of abstract paintings. The study included two sessions. Participants' knowledge about artwork was manipulated by providing them with information about abstract art in general or explaining specific works of art. It is found that additional information may affect cognitive aspects of participants' appreciation of artwork (comprehension of artwork), while aesthetic aspect remains unchanged. These findings have a practical purpose when organizing artistic exhibitions, indicating that provision of information explaining an abstract work of art can increase understanding of the artwork among naïve observers.

Keywords: aesthetic experience; abstract art; education.

Introduction
Artwork experience is influenced by the characteristics of the artwork, characteristics of an observer (Locher, 2014), the social environment, and their mutual interaction. Characteristics of works such as pictorial characteristics (Bar & Neta, 2006), thematic content (Heinrichs & Cupchik, 1985; Tinio & Leder, 2009), style (Radonjic & Markovic, 2004), and composition (Arnheim, 1998; Locher, 2003) influence the aesthetic experience of artwork. Also, the characteristics of an observer's personality (Feist, 1998; Furnham & Walker, 2001), intelligence (Chamorro-Premuzic & Furnham, 2005), emotional state (Robinson, 2005; Silvia, 2005a), and expertise (Augustin & Leder, 2006; Hekkert & van Wieringen, 1996; Leder, Belke, Oeberst, & Augustin, 2004) have influence on this experience.

This paper will examine whether and how information about artwork or artistic movement to which an artwork belongs influences the judgment of aesthetic experience of naïve observers.

Research conducted thus far has shown that information about artistic movements, artistic style, and specific works of art positively influences subjective experiences of observers; however, research is not conclusive about which particular aspect of the experience is most influenced by this information. Displaying titles of abstract and semi-abstract paintings increased the sense of meaningfulness and decreased the perception of abstractness, but had no influence upon hedonic value (Russell & Milne, 1997). Recently Leder, Carbon, and Ripsas (2006) found similar results: elaborative titles increase the understanding of abstract paintings but not their appreciation. Stojilovic (2013) found increase in rating of creativity and understanding, but not in aesthetic value after title exposure. Russell (2003) found increases in individual's aesthetic appreciation or aesthetic emotional experience as a result of providing additional information and elaboration about paintings. There is some evidence that information on the context and conditions under which artwork was created increases enjoyment of the work (Temme, 1992). Appreciation was enhanced, but only for paintings that were vague or ambiguous. Temme suggested that the increase of enjoyment occurs due to a decrease of uncertainty. He also found that visitors who rarely visit museums and with little education on the arts have the greatest “need for information” about a work they observe. Another study found that information (presented as paintings’ titles) might increase aesthetic experiences (e.g., enjoyment, interest) when they suggest an alternative explanation to what can be readily inferred from the explicit artwork (illustrations and photographs) (Millis, 2001). It has also been demonstrated that training and knowledge can increase one's self-evaluation of coping potential and ability to understand visual art, leading to increased ratings of a painting as interesting (Silvia, 2005a, 2005b, 2006; Silvia & Berg, 2011). However, results regarding the effects that various types of information have on perceptions of artwork have been equivocal. For example, Smith, Bousquet, Chang, and Smith (2006) found that ratings of artwork with labels did not differ from ratings of artwork without labels. Also, it is found that impact of information, particularly artists' statements, depends on certain salient features of the information; however, these effects are not reliant on the nature of the work, such as representation and non-objective artworks (Specht, 2010).

In the present study, the researcher examined the impact of providing additional information on the ratings of a naïve participant on abstract paintings. The study is based on the cognitive processing model, which emphasizes the importance of factors such as art expertise and art knowledge in aesthetic experience, especially in the works of contemporary art (Leder et al., 2004). The model identified five essential stages of information processing and a number of variables that affect aesthetic judgments and aesthetic emotions concerning art. The third processing stage of the model called “Explicit Classification” provides explicit representations of either depictive content or explicit style information of the artwork. According to this model an increase in comprehension of the artwork might result in an increase of aesthetic appreciation of the artwork.

There were two main types of information presented. The first type was a lecture on abstract art in general because all of the rated paintings were abstract. The second type of information provided was the explanation of the meaning behind each of the rated abstract paintings. These two types of information were chosen as they represent the two ways one is usually introduced to an abstract work of art: either through learning a wider context to which an artwork belongs (information on the movement, school or epoch to which an
artwork belongs) or through detailed information about a specific work of art. The aforementioned information was provided through oral lectures delivered by the author, who holds a degree in fine arts, of this paper. Lectures were chosen because the researcher’s previous study has indicated that providing additional information through written text has a weaker impact than an oral lecture (Stojilović, 2012, 2013). Lectures for different groups were controlled by having a previously prepared text (on abstract artwork or on individual painting) read by the lecturer. Attention was paid to ensuring that the quality and scope of the provided information in both lectures were as equal as possible. To do this when creating texts for both types of lectures, the same sources were used. Additionally, the amount of the information provided was similar: the lecture about Abstract art had 2,393 words and the explanation of presented paintings had 2,319 words in total.

**Methods**

**Participants:** A total of 85 students of psychology enrolled at the University of Belgrade participated in this study. Gender effects were not estimated because of the small number of men in the sample. The mean age was 19.5 years [range: 17–28]. In order to avoid mediated influence of art-related knowledge (Leder et al., 2006) the researcher examined only naïve observers without prior systematic art-related education and art training and with moderate interest in visual art. The group consisted of naïve viewers most of whom stated that they attended no courses in art before (68%) and with moderate interest in art (56.5% reported moderate or lower interest in art). The majority of them reported that in the last year they did not visit a museum or they visited a museum 1-3 times (27% and 52%, respectively) and did not visit or visited an art gallery 1-3 times (34% and 42%).

**Stimuli:** Only abstract paintings that do not represent recognizable objects were used in the study. Abstract art appeared at the beginning of the 20th century and represents a deflection from representational art. Abstract art was chosen for this study because it tends to rely only on visual language of shapes, forms, lines and colors. There were two parallel groups comprised of 7 abstract paintings in each session. The paintings were chosen as representative for an abstract visual art group based on relevant books on art history (Bayrle, 2007; Groenick, Riemschneider, & Larsen, 1999; Hastings, 2011; Janson, 1996; Lucie-Smith, 2003) and intersubjective agreement of three independent observers.

**Instruments for Measurement:** The instruments consisted of: a) general demographic questionnaire (gender, age and questions related to participants’ experience with art), b) an art knowledge test consisting of 20 art history related questions c) an abstract art interest questionnaire (4 questions related to their knowledge, attitude, interest and readiness to hang abstract art on their wall), d) the Positive and Negative Affect Schedule (PANAS) (Watson, Clark, & Tellegen, 1988) and e) a subjective aesthetic experience questionnaire (consisting of 20 rating scales).

**Procedure:** The study included two sessions. The researcher explained that the study was about people’s subjective experience of abstract paintings. In the first session, 85 naive participants first rated a set of seven abstract paintings on 20 semantic-differential type scales. After seven days participants were randomly divided into nine groups of eight to 12 participants. During this second session participants rated the second set of seven abstract paintings, complementary to the first to avoid an increase of appreciation due to mere exposure. In the second session all presented paintings were from the same artists and the same or similar time period as in the first set.

The first group (“Style group”, N=29) attended a 45-minute lecture about abstract art before judging the paintings. The lecturer used a PowerPoint presentation and explained the historical background of the abstract style, development, and sub-styles, while also providing explanations about characteristics and meanings of the paintings. After the lecture the participants judged a new set of abstract paintings.

While observing individual abstract paintings in the second session, the second group (“Painting elaboration group” N=28) received additional information on each painting provided by the lecturer. It included information about the author, title, dimensions, place where the painting is exhibited as well as the explanation about the painting. Finally, the third group (“Control group”, N=28) did not attend any lecture in the second session, but immediately rated the parallel set of seven abstract paintings.

**Results**

First the stringing out method (Osgood, 1975; Osgood, Succi, & Tannenbaum, 1957) was used which allows a 3-D data matrix (Participants x Stimuli x Scales) to be organized into a 2-D matrix by arranging the single stimuli matrices one under the other. Having in mind that we were not interested in individual differences, but in general factorial structures of the paintings’ judgments, we could allow the multiplication of the relatively small sample of participants, but not the reduction of paintings or number of scales (Marković, 2010). Principal component analysis on the judgment of abstract paintings before and after the lecture was conducted separately. In order to determine the numbers of dimensions to be retained, parallel analyses were conducted (O’connor, 2000). Parallel analysis indicated that two dimensions should be extracted for abstract paintings in both sessions.

The two dimensions were extracted using direct oblimin rotation, which explained 57.8% of the variance. The first dimension, Aesthetic value (Eigenvalue after rotation=9.65) includes the following scales that are related to the aesthetic experience of the painting: Interesting (factor loading .91), Creative (.86), Fascinating (.86), Exceptional (.85), Likeable (.84), Exciting (.83), Beautiful (.82), Not Boring (.80), Unusual (.79), Original (.78), Expressive (.73), Not Ugly (.68) and Pleasant (.65). The second dimension,
Comprehension (Eigenvalue after rotation=3.15) is related to how comprehensible the painting is and includes the scales: Realistic (.73), Comprehensible (.71), Not Confused (.65), Meaningful (.52), Realistically painted (.51) and not Abstract (.51).

A two-way mixed ANOVA was used with one within-subjects factor Session (2 levels, Pre- and Post-session) and one between-subjects factor Lecture (3 levels, Abstract art style, Painting elaboration and Control group without lecture).

The ANOVA revealed that Session, F(1,82)=51.54, p<.001, $\eta^2_p=.37$ had a significant effect for the dimension Comprehension, but Lecture, F(2,81)=1.70 is not significant. Most interestingly, there was also significant interaction between both factors (F(2,82)=4.65, p<.05, $\eta^2_p=.10$). Simple effects analysis showed that all groups rated significantly higher comprehension of abstract paintings in the second session – difference for control group is 0.20, p<.05, for Abstract style group is 0.39, p<.001 and for Painting elaboration is 0.63, p<.001. An analysis of simple main effects of Lecture on Session revealed that the factor Lecture was significant for Post-Session F(2,82)=4.36, p<.05, $\eta^2_p=.37$ had a significant effect for the dimension Aesthetic value which is predominantly an emotional dimension (Leder, Gerger, Dressler & Schabmann, 2012). Additionally, the type of information provided has a different impact on understanding artwork. Providing information, such as interpretations and explanations about the intention of the artist, on an individual piece of art has a stronger effect on understanding the piece than providing general information about abstract art.

The additional information on artwork that was provided had an impact on the cognitive component of artworks rating but had no influence on the Aesthetic value which is an emotionally more valuable, which is obviously influenced by some other factors, one of which is mere exposure. Earlier findings about the strong influence of mere exposure (Cutting, 2003) to an artwork, particularly when an image is otherwise rare, have been confirmed. These findings also indicate the significance of the mere exposure effect, since different paintings were used in two sessions in the experiment, but there was still a strong increase in appreciation of the abstract artwork.

In the present study we manipulated participants’ knowledge about artwork by providing them with information about abstract art in general or explaining specific works of art. It is found that additional information may affect some aspects of participants’ appreciation of artwork, while other aspects remain unchanged. Earlier findings about the strong influence of mere exposure (Cutting, 2003) to an artwork, particularly when an image is otherwise rare, have been confirmed. These findings also indicate the significance of the mere exposure effect, since different paintings were used in two sessions in the experiment, but there was still a strong increase in appreciation of the abstract artwork.

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These findings have a practical purpose when organizing artistic exhibitions, indicating that provision of information explaining an abstract work of art can significantly increase understanding of the artwork among naïve observers. However, it should be pointed out again that this additional information does not influence the rating of an artwork as aesthetically more valuable, which is obviously influenced by some other factors, one of which is mere exposure. This can show us how to make naïve observers appreciate abstract art more and how to motivate them to visit artistic exhibitions more frequently. An interesting question could also be raised about the influence of such information on art experts and their experience of a piece of art i.e. whether the painting elaboration may lead to stronger aesthetic evaluation among them, taking in to consideration differences in art processing among art experts and naïve participants (Nodine, Locher, & Krupinski, 1993).

For the second factor Aesthetic value, the ANOVA revealed that only Session, F(1,82)=6.21, p<.05, $\eta^2_p=.07$ had a significant effect on the ratings. Ratings were significantly higher in the second session compared to the first one.

In order to uncover possible confounding effects of art interest, art knowledge, and mood on the ratings on Comprehension and Aesthetic value, the mixed ANOVA was repeated with the art interest, art knowledge, and mood factored in as covariates. The results showed that, generally speaking, the significant main effects and interaction effects of the original analysis are not due to covariation of art interest, art knowledge, and mood with the experimentally manipulated variables.

**Discussion**

In the present study we manipulated participants’ knowledge about artwork by providing them with information about abstract art in general or explaining specific works of art. It is found that additional information may affect some aspects of participants’ appreciation of artwork, while other aspects remain unchanged. Earlier findings about the strong influence of mere exposure (Cutting, 2003) to an artwork, particularly when an image is otherwise rare, have been confirmed. These findings also indicate the significance of the mere exposure effect, since different paintings were used in two sessions in the experiment, but there was still a strong increase in appreciation of the abstract artwork.

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The Joint Effect of Typicality and Novelty on Aesthetic Pleasure for Product Designs: Influences of Safety and Risk

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Abstract
While some studies have shown that people prefer typical product designs, others have shown that people also like product designs that are new. To reconcile these contradictory findings, the design principle, ‘Most Advanced, Yet Acceptable’ proposes that people prefer a balance of both typicality and novelty in product designs. As an explanation, we propose that typicality and novelty fulfill basic evolutionary needs for safety and exploration that still drive behaviour today, and that products are most preferred when they satisfy both of these needs simultaneously. We further propose that conditions of safety and risk will drive product preferences towards novelty and typicality, respectively. Overall, this research will provide insights into when and why aesthetic preferences for typicality or novelty occur.

Keywords: Aesthetic pleasure; typicality; novelty; design; products; evolutionary psychology.

Introduction
Aesthetic preferences play a significant part in enriching the quality of our everyday lives. We use such preferences to add order, bring satisfaction, and guide attitude-formation behaviour. While research within the domain of aesthetics has traditionally centered on artworks, any object or landmark can be appreciated aesthetically. Thus, it is no wonder that human-made artefacts such as products are usually deliberately designed to be visually pleasing (Postrel, 2003). However, questions remain regarding what denotes aesthetic pleasure, or ‘beauty’. Traditional determinants of aesthetic pleasure include properties such as symmetry, figure-ground contrast, clarity, unity, variety, typicality, and novelty. However, the findings regarding how these design properties influence aesthetic pleasure are often contradictory. For instance, the influence of the cognitive determinants, typicality and novelty, on aesthetic preferences has been investigated for a range of natural and man-made stimulus types and the findings are mixed. Several studies show that people prefer typical instances of a stimulus category (Halberstadt & Rhodes, 2003; Purcell, 1984; Whitfield, 1983), while others have shown that we are also drawn to stimulus examples that are new (Bianchi, 2002). Others again suggest striking a thoughtful balance between both typicality and novelty for maximum appreciation of product designs (Hekkert, Snelders, & van Wieringen, 2003). We contribute to the literature by examining the combined effects of both typicality and novelty on aesthetic evaluations of consumer products. In the sections to follow, we provide an evolutionary psychological account of aesthetic preferences for product designs. We show how product preferences reflect basic opposing evolutionary needs for safety and accomplishment. Then, we show how we expect contextual manipulations of safety and risk to shift preferences towards novelty and typicality, respectively, as a function of these basic evolutionary needs.

Cognitive Determinants of Aesthetic Pleasure: Typicality and Novelty
Previous research has demonstrated that people prefer typical instances of a stimulus category for a range of stimuli including colour samples (Martindale & Moore, 1988), geometric patterns (Winkielman, Halberstadt, Fazendeiro, & Catty, 2006) furniture (Whitfield, 1983), paintings (Hekkert & van Wieringen, 1990), and other natural and artificial categories such as animals, wristwatches, and automobiles (Halberstadt & Rhodes, 2000, 2003). This preference for the typical or familiar is consistent with the mere exposure hypothesis (Zajonc, 1968); the preference for repeatedly encountered stimuli. This effect has been found for a range of stimuli including meaningless stimuli such as polygons (Kunst-Wilson & Zajonc, 1980) and meaningful real-world stimuli including faces (Peskin & Newell, 2004) and consumer products (Hekkert, Thurgood, & Whitfield, 2013). However, typicality is not the only thing people are always after; people are also often drawn towards the new. A preference for novelty has been demonstrated for a range of consumer products including tea-kettles, sanders, telephones, and product-packaging (Blijlevens, Carbon, Mugge & Schoormans, 2012; Schoormans & Robben, 1997). In contrast to the aforementioned mere exposure studies, a recent study found that people preferred new pictures of scenes and objects over pictures that had been repeatedly encountered (Biederman & Vessel, 2006).
Most Advanced Yet Acceptable (MAYA)

We have shown that people sometimes prefer typicality and at other times they prefer the new. However, a preference for typicality seems incompatible with a desire for the new. In an attempt to reconcile these contradictory findings, the design principle, ‘Most Advanced, Yet Acceptable’ (MAYA) proposes that people prefer a balance of both typicality and novelty in product designs. This principle has since been tested experimentally using a range of consumer products, and it has been found that the most attractive product designs are those that maximise both typicality and novelty simultaneously (Hekkert et al., 2003). Subsequent studies using different product categories confirm that typicality and novelty are separate factors that both positively influence aesthetic appraisal (Blijlevens, Gemser, & Mugge, 2012).

Evolutionary Explanation for MAYA: Influences of Safety and Risk

Our aesthetic preferences for objects are directed by two opposing evolutionary forces that operate simultaneously and still guide our behaviour today. The first is aimed at the preservation of life, and the second at the furtherance of conditions of growth (e.g., Damasio, 1994). On the one hand, people prefer stimuli that are safe, provide security, and demand little processing capacity. And on the other hand, people are motivated to take risks, engage in exploratory behavior, and to promote learning. Thus, safety/security seeking and explorative behaviours are equally pleasurable because they are both beneficial for the survival of the human species. Hence, product designs that help optimize safety and accomplishment are the most aesthetically pleasing. It can be argued that typical events fulfill the need for safety, while novel events fulfill the need for exploration. It is adaptive to favour stimuli that are typical or familiar because it leads to safer choices, and avoidance of potential harm (Bornstein, 1989). However, we are also drawn towards novelty as this offers discovery and learning (Bornstein, 1989). Hence, when product designs fulfill these needs for typicality and novelty they influence the more basic evolutionary needs for safety and exploration, which consequently positively relates to positive aesthetic pleasure for these designs. We propose that those product designs that optimize both the need for typicality and novelty simultaneously are the most aesthetically pleasing (e.g. MAYA: Hekkert et al., 2003) because people are equally motivated to maximise both safety and accomplishment needs (Hekkert, 2014). However, we also argue that a trade-off between these needs exists and that, under certain conditions, a preference for either typicality or novelty will prevail (Hekkert, 2014). Under one such condition, namely risk, we suggest that people might prefer typical over novel designs, as they are inherently motivated to increase their safety needs, and a novel product design might be considered more risky than a typical design. Correspondingly, when a situation is safe, people might prefer novel to typical designs, as they are motivated to maximize their learning and accomplishment needs.

Thus, through two experiments, we sought to confirm whether (1) typicality and novelty jointly contribute to aesthetic pleasure for product designs, and to determine whether (2) conditions of safety and risk drive product preferences towards novelty and typicality, respectively.

Experiment 1: The Balanced Effect of Typicality and Novelty as Joint Predictors of Aesthetic Pleasure for Product Designs

Introduction

In our first experiment we sought to confirm whether typicality and novelty jointly contribute to aesthetic pleasure for product designs (Hekkert et al., 2003) as people are equally motivated to increase their safety and accomplishment needs. We exposed participants to photographs of lamps covering a wide range of typicality and novelty. Participants rated the different designs according to measures of typicality, novelty, and aesthetic pleasure.

Method

Stimuli Selection

Twelve photographs of lamps sourced from various home-furnishing websites were selected to serve as stimuli. The designs were deliberately chosen to cover a wide variety of typicality and novelty. In choosing the stimuli, one researcher selected a variety of designs from the internet, then four researchers (two with backgrounds in psychology and two in industrial design) independently chose the four designs that they thought were the most typical, the four that they found the most novel, and the four that they thought comprised features of both novelty and typicality simultaneously. As a group, they compared their selections and where there were discrepancies they came to decisions through group discussions until they were all in agreement regarding which stimuli to use.

Participants

Forty-eight participants took part in this experiment (mean age = 45.56 years, SD = 13.08 years, 26 females). Participants were recruited from a consumer panel representing the Australian population and received a small token award for completing an internet-based questionnaire. All participants were Australian and reported English as their first language.

Procedure

Exposure Phase Participants were informed that they would be presented with 12 product designs that they would later be asked to rate according to their visual appearance. The lamps were presented one at a time, in random order, at a participant-paced interval. Participants were encouraged to view each lamp briefly without spending too much time on
any particular design, as the purpose was simply to familiarise themselves with the designs.

**Test Phase** Participants were told that they were about to be presented with the same 12 lamps again and that this time they would be asked to indicate the degree to which they agreed with a set of descriptive statements regarding the visual appearance of the lamps. Aesthetic pleasure was measured with three items (“this is a beautiful lamp”, “this is an attractive lamp”, and “this lamp is pleasing to see”), typicality was measured with three items (“this is a typical lamp”, “this is a standard design”, and “this is representative of a lamp”), and novelty was measured with three items (“this is a novel lamp”, “this design is innovative”, and “this design is original”). Three filler items relating to functionality were also used (“this design seems sensible”, “this lamp seems functional”, and “this design seems practical”). All rating scales had seven levels whereby 1 = strongly disagree and 7 = strongly agree. Product designs and order of rating scales were presented in random order, at a participant-paced interval. A principle components analysis with Varimax rotation and extraction based on three factors was performed using all the items for aesthetic pleasure, typicality, and novelty, and revealed them to be separate constructs from one another, explaining a total of 85% of the variance (eigenvalues 4.49, 2.51, and .66, item loadings > .7). Furthermore, all scales demonstrated high reliabilities with Cronbach’s α = .96, .90, and .85 for aesthetic pleasure, typicality, and novelty, respectively. Thus, overall variables for aesthetic pleasure, typicality, and novelty were created by averaging the scores of the individual items.

**Results**

**Hypotheses Testing**
Significant positive correlations were found between typicality and aesthetic pleasure ($r = .59, p < .01$) and novelty and aesthetic pleasure ($r = .43, p < .01$). The correlation between typicality and novelty did not reach significance ($r = -.04, p > .05$).  

In order to assess the combined effects of typicality and novelty on aesthetic pleasure, a regression analysis was performed on the mean aesthetic pleasure ratings. As expected, both typicality and novelty positively influenced aesthetic pleasure for product designs ($R^2 = .55, F(2, 573) = 349.87, p < .001$, $\beta_{\text{typicality}} = .61, p < .001$, $\beta_{\text{novelty}} = .45, p < .001$). Hence, both typicality and novelty explain aesthetic pleasure.

**Discussion**

As expected, both typicality and novelty jointly contribute to aesthetic pleasure for product designs. Product designs are preferred when they are both typical and novel. We argue that this is the case because people are motivated to increase both their safety and accomplishment needs. Contrary to expectations, typicality and novelty were not negatively related to one another. This was surprising given that the two constructs are assumed to be each other’s opposites. However, our findings might be a reflection of the items used to measure the constructs. While the items ‘typical’ and ‘novel’ might be considered directly each other’s opposites, the other items for typicality (‘representative’ and ‘standard’) and novelty (‘innovative’ and ‘original’) might not. Indeed, when ‘typical’ and ‘novel’ were used in isolation to measure typicality and novelty, the expected negative relationship was found.

**Experiment 2: Influences of Safety and Risk on the Joint Effect of Typicality and Novelty on Aesthetic Pleasure for Product Designs**

**Introduction**

In our second experiment we aimed to determine whether conditions of safety and risk drive product preferences towards novelty and typicality, respectively, as people are motivated to maximise their accomplishment and safety needs. Situations of safety and risk can be construed in many ways. For instance, certain types of product categories might inherently carry more risk than others: expensive products or socially important products might be considered more risky than less expensive or less socially important products. People can also be primed to perceive certain situations as more risky than others. For instance, situations where people expect their preferences to be evaluated by others (public consumption) might be more risky than situations where no such evaluation is expected to take place (private consumption). Similarly, by repeatedly evaluating products on dimensions related to safety or risk, we might be able to prime participants to engage in a safe or risky mindset. Such a procedure, the Repeated Evaluation Technique (RET: Carbon & Leder, 2005), was used in the current study whereby participants rated products (lamps or clocks) on multiple dimensions that stressed either social safety or risk. Rating stimuli on multiple dimensions provides a deeper level of stimulus elaboration that activates discrete situational or semantic concepts (Faerber, Leder, Gerger, & Carbon, 2010). In the safe context, it is assumed that the participant’s mindset is primed towards safety and thus, they are potentially more open to new, ‘riskier’ experiences, including preferences for novelty. Conversely, in the risky context, it is assumed they are primed towards risk, and are therefore likely to gravitate towards safer, typical choices. The RET technique was used in a recent study (Carbon, Faerber, Gerger, Forster, & Leder, 2013) to show that innovative product designs are appreciated following repeated evaluation of their fascinating (‘safe’) aspects of innovation, but not following elaboration of dangerous aspects of
innovation. In our case, the intention was to induce a mindset of either (social) safety or risk under which participants’ aesthetic evaluations would take place. Following the extended rating phase, measures of typicality, novelty, and aesthetic pleasure were obtained.

**Method**

**Stimuli Selection**
The same twelve photographs of lamps from Experiment 1 were chosen to serve as stimuli for replication purposes. Twelve photographs of clocks were also chosen to serve as stimuli to ensure our findings are applicable over different product categories. No differences were expected between product categories.

**Participants and Design**
Two hundred and eight participants took part in this experiment (mean age = 51.08 years, SD = 16.23 years, 107 males). Recruitment procedures were the same as in Experiment 1. The participants were divided into four subgroups based on a 2 x 2 between-subjects research design with two levels of product stimuli (lamps and clocks) and two levels of social risk (social safety and social risk).

**Procedure**

**Exposure Phase**  This was identical to Experiment 1.

**Repeated Evaluation Phase**  Participants were told that they were about to be presented with the same 12 lamps (clocks) again and that this time they would be asked to indicate the degree to which they agreed with a set of descriptive statements regarding the visual appearance of the design. In order to induce a specific mindset of either safety or risk, they were instructed to think of how the visual appearance of the design makes them feel in relation to other people. When making their ratings, they were encouraged to imagine that they currently owned these products, even if in real life they would not own such designs. To generate safe or risky conditions, participants rated the product designs on eight dimensions emphasising social safety or social risk. In particular, we chose items that reflected social inclusion or exclusion to represent safety and risk, respectively. For example, in the safe condition, we used items such as “this design makes me feel connected to other people,” and in the risky condition we used items such as “this design shows that I do not fit in with other people”. All rating scales had seven levels whereby 1 = strongly disagree and 7 = strongly agree. Product designs and order of rating scales were presented in random order, at a participant-paced interval.

**Test Phase**  The test phase was the same as in Experiment 1, however, in order to reduce the workload and so as not to detract from the manipulation of the RET, aesthetic pleasure was measured with one item, “this is a beautiful lamp/clock”, typicality was measured with one item, “this is a typical lamp/clock”, and novelty was measured with one item, “this is a novel lamp/clock”. These items are representative of their respective constructs theoretically, and were chosen based on the findings of our first experiment. To be confident that the items still fully captured the constructs of interest, we explained to participants what we meant by typical, novel, and beautiful by using the other relevant items from Experiment 1 (e.g., “by typical, we mean how representative or characteristic you think the given design is for the product category, lamp/clock”).

**Manipulation Check**  In order to check whether participants in the safe condition did feel more safe following the RET than those in the risky condition, and vice versa, at the end of the questionnaire participants were asked to indicate how safe they felt, with the following items: “I feel at ease”, and “at the moment, I feel the sense of safety of being included by other people”; and how at risk they felt, with the following items: “at the moment, I feel the sense of safety of being excluded by other people”, and “I feel uncomfortable”. Again, all rating scales had seven levels whereby 1 = strongly disagree and 7 = strongly agree, and their order was presented in a random fashion. Composite variables for safety and risk were created by averaging the scores of the individual items (Cronbach's α = .44 for safety, and .54 for risk).

**Results**

**Manipulation Check**  Independent samples t-tests between the safety and risk groups were used to test for differences between perceived safety and risk. Contrary to expectations, following the RET, there were no significant differences in perceived safety between safe (M = 5.06, SE = .13) or risky (M = 5.00, SE = .11) groups (t(206) = .39, p = .70), nor in perceived risk between safe (M = 2.71, SE = .15) or risky (M = 2.41, SE = .13) groups (t(206) = 1.53, p = .13). However, it might be possible that participants were not consciously aware of the safe/risky mindset, and hence we proceeded with data analyses as planned.

**Hypotheses Testing**

As with Experiment 1, significant positive correlations were found between typicality and aesthetic pleasure overall (r = .26, p < .001) and novelty and aesthetic pleasure overall (r = .12, p < .001). This time, a significant negative correlation was found between typicality and novelty overall (r = -.52, p < .001).

In order to assess whether safety and risk moderated the effects of typicality and novelty on aesthetic pleasure, a hierarchical regression analysis was performed on the mean aesthetic pleasure ratings, with the independent variables typicality and novelty entered in Step 1, a dummy variable for level of risk (safe, risk) and its interaction terms as independent variables in Step 2, a dummy variable for product category (lamp, clock) and its interaction terms as independent variables in Step 3, and all three-way interactions as independent variables in Step 4. The first regression model was statistically significant, indicating that
with the findings of the current study and with an evolutionary account for aesthetic preferences: the need to fulfill safety needs was greater for lamps than for clocks. This, and other ideas will be further explored in our future research and are described in more detail in the following section.

**General Discussion**

As expected, our first experiment revealed that both typicality and novelty jointly and positively explained aesthetic pleasure. The results are consistent with past research (Blijlevens et al., 2012; Hekkert et al., 2003) and support an evolutionary explanation for aesthetic preferences – product designs are preferred when they strike an optimal balance between typicality and novelty, as people are equally motivated to increase their safety and accomplishment needs.

Contrary to expectations, our second experiment did not find our manipulation of safety and risk to drive product preferences towards novelty and typicality, respectively. Instead, our results again confirmed that people prefer a balance between typicality and novelty for aesthetic pleasure for product designs. This may have been caused by the fact that our manipulation of safety/risk was too weak: our manipulation check did not reveal any significant differences in perceived risk or safety between the safety and risk conditions. Thus, future research is still required to ascertain whether or not safety and risk do direct preferences towards novelty and typicality.

As mentioned, our choice of social RET items might have been too far-removed from our cognitive constructs (typicality and novelty) to have sufficiently induced conditions of safety and risk. Given that the RET aims to encourage deep elaboration of the inner qualities of consumer products, in our future research, we endeavour to repeat the process again but to create associative contexts using items that directly pertain to safe and risky aspects of typicality (e.g. “familiar”, “normal”) and novelty (e.g. “dangerous”, “unpredictable”). We also plan to repeat the existing social risk RET procedure with product categories that differ in initial level of social risk (e.g. sunglasses might be more socially risky than lamps or clocks, and thus more susceptible to our social risk manipulation).

Furthermore, another conceptualization of risk that we plan to explore is the idea that (cognitive) risk refers to being prevented from achieving what we want to do at the level of cognitive processing. As already indicated, risk might manifest when we are not able to readily categorize/identify stimuli. ‘Risky’ products might be harder to immediately identify or recognize than safe products because they look like/share common features with other product-types (e.g. product-types such as food processors, blenders, and juicers share a strong familial resemblance compared to other more distinctive product-types such as clocks).

This continuing research will provide insights into the relationships among typicality, novelty, and contextual influences on aesthetic evaluations of product designs. Thus, not only will this research provide substantial theoretical
contributions, but it will also have practical implications within areas such as advertising and product design.

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References
Unravelling Typicality in Mundane Aesthetics

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Abstract
Novelty and typicality play important roles in aesthetic preference. Typicality, strongly linked with the cognitive process of categorization, posits that familiar stimuli will be most preferred. Novelty, a fundamental construct of Berlyne's Collative Motivation Model, sits in opposition to this, proposing that increased arousal levels produced by unfamiliar stimuli drive positive affect. Within the domain of designed objects, novelty is considered a key for product differentiation and to drive market success. This paper discusses the relationship of novelty to typicality, hypothesizing the existence of two types of novelty, congruent and incongruent, based on category knowledge. It outlines the theoretical underpinnings of the method used to test the hypothesis, ‘multi-level measures’.

Keywords: Typicality; novelty; aesthetic preference; product design; categorization

The Role of Typicality and Novelty in the Aesthetic Appraisal of Product Designs

Typicality, formerly Preference-for-Prototypes (Whitfield and Slatter, 1979), has proved a dominant force in aesthetic appraisal, reliably proving to have predictive status over a number of stimulus categories including artworks, music, linguistics, products and product labelling (Celhay and Passebois, 2011; Farkas, 2002; Hekkert and van Wieringen, 1990; Fazendeiro, Winkelman, Luo and Lorah, 2005; Loken and Ward, 1987; Messinger, 1998; Smith and Melara, 1990; Veryzer and Hutchinson, 1998; Whitfield, 1983). The preference for typical stimuli has largely been attributed to the ease and speed of processing fluency, familiarity and safety (Reber, Schwarz and Winkielman, 2005), with typical stimuli often being referred to as ‘familiar’, ‘goodness of example’, ‘best representative’ (Hekkert, Snelders, and Wieringen, 2003; Whitfield and Slatter, 1979), or category ‘prototypes’ (Rosch, Mervis, Gray, Johnson, and Boyes-Braem, 1976; Rosch, 1999). In the specific domain of product design, which includes objects such as furniture, cars, and household items, again, typicality has proven a key determinant of preferential aesthetic appraisal (Blijlevens, Carbon, Mugge and Schoormans, 2012; Hekkert, Snelders, and Wieringen, 2003; Landwehr, Labroo and Herrmann, 2011; Schoormans and Robben, 1997; Whitfield and de Destefani, 2011).

However, if strictly adhered to, a preference for typicality would produce no new examples in any product category (Martindale, 1996). This is evidently not the case as new products are continuously entering the market place. Why then are objects that change in appearance positively appraised? It appears that while a preference for typicality may often be the case, in some instances differences, or novelty, is permitted into a product category, and is preferred to typical exemplars. Product designs often rely on novelty to create product differentiation and success in the marketplace, and are associated with innovation (Berlyne, 1987), modernity (Blijlevens, Mugge, Ye and Schoormans, 2013; Hung & Chen, 2012) and uniqueness (Hekkert, Snelders, and Wieringen, 2003).

Dominating the field of experimental aesthetics in the 1960s and 1970s, Berlyne proposed the Collative Motivation Model to Aesthetics (Berlyne, 1971) positing that the preferential appraisal of stimuli was predominately mediated by a set of collative variables; novelty, complexity, incongruity and conflict. When present, these variables would increase mental arousal levels, activating the brain’s reward system, resulting in the preferential appraisal of stimuli. A stimulus that was deemed to be ‘ordinary’ was considered too uninteresting to excite interest, and was hence not aesthetically pleasing. However, arousal was required to be moderated, as anything deemed too new, different or novel would consequently be too arousing, initiating the brain’s aversion system, and with it negative appraisal. There seemed to be an optimum level at which variables such as novelty operated in order to engage stimuli that were aesthetically preferred.

The MAYA principle – Most Advanced Yet Acceptable –, (Hekkert, Snelders, and Wieringen, 2003) proposes that typicality and novelty are joint predictors of preference, requiring both variables to be maximized in order to elicit preferential appraisal. This suggests that an underlying relationship between typicality and novelty exists, and that a category exemplar that maintains an adequate amount of typicality to complete fundamental cognitive tasks such as recognition, yet possess a certain degree of variation from the category prototype, will be most preferred. This is similarly reflected in Berlyne’s Collative Motivation Model, whereby stimuli able to achieve intermediary levels of arousal are considered more likely to elicit preferential appraisal (Berlyne, 1971).

In order to achieve the optimal level of arousal, or novelty, there must then exist a relationship between what is novel to what is typical or known; alternatively phrased, that which is new relative to that which is known.

Berlyne’s Collative Motivation model proposed that novelty comprised of three constituents; (1) Change, the alteration of
stimuli, (2) \textit{Suprisingness}, the existence of an expectation, which the stimulus is in disagreement or contradicts with, and (3) \textit{Incongruity}, similar to suprisingness, however eliciting disappointment when the expectation and stimulus is in disagreement (Berlyne, 1960). In addition, novelty was also subject to individual experience; an experience or stimulus can only be novel relative to an individual’s experience of it. A stimulus could either possess long term or short term novelty, as well as being either an instance of absolute or relative novelty. In the case of absolute novelty, the experience would be new relative to the total experience, whereas in the case of relative novelty, the experience would be different from other elements in the immediate context, or different from the expectations of that context. This outlines the challenges involved in plainly defining novelty, as an experience or stimulus will have some connection or relation to other experiences that have preceded it, and would then be dependent on; (1) how an experience that is similar enough to be relevant, has itself been experienced, (2) how recently it has been experienced, and (3) how similar these experiences have been (Berlyne, 1960). Unless a stimulus was a case of absolute novelty – an occurrence that was considered to take place under extreme circumstances i.e. a newborn baby or a person regaining their sight – all other experiences would have a prior point of reference that any new or novel experience could be placed, and thus would be considered relative novelty (Berlyne, 1960).

Previous research of novelty in product designs has shown that with regards to product appearance, extremely high levels of arousal are not easily achieved and that most products are designed to be aligned with their category prototype, displaying only limited amounts of novelty (Blijlevens, Carbon, Mugge and Schoormans, 2012). The influence of novelty on product designs also appears to be associated with learning, or acquiring new operational knowledge when deviating from the prototype. Studies show that incrementally new products, where consumers are required to import existing knowledge from previous products, are preferable to radically new products, which are more difficult to understand as they are less related to existing categories. These radically new products may be able to perform functions not possible with existing products; however, their benefits are uncertain, as greater behavioral change is required in order to attain them (Moreau, Markman and Lehmann, 2001). Indirect familiarity of stimuli also plays a key role in the preference for novelty. Factors including, advertising exposure, information search and interaction with sales staff can make a previous unused or novel product seem familiar (Alba and Hutchinson, 1987), as does repeated exposure to novel product designs (Cox and Cox, 2002; Landwehr, Labroo and Herrmann, 2011), which positively influences preference.

These findings suggest that the novelty of product designs will largely be relative novelty, requiring some reference to the existing knowledge of a product category. It also suggests that in order to understand what constitutes relative novelty, and how to achieve the optimum levels needed to elicit preferential appraisal, what is first required is a comprehensive understanding of what constitutes typicality. As typicality refers to the features that best represent a category (Rosch, Mervis, Gray, Johnson, and Boyes-Braem, 1976; Rosch, 1999), and because products are represented by any number of features, to determine what novelty is considered relative to prior experience and thus preferred, requires an understanding of typicality not only of the individual product itself, but also related information residing at the basic, subordinate and superordinate category levels, as well as object part representation.

It is hypothesized that a product design’s typicality is dependent on a number of variables, which include physical (perceptual) properties – shape, colour and texture – associated with its category. As such, ‘multi-level measures’, which separates products into parts, and then further into non-part attributes – the shape, colour and texture of individual product parts – is used to measure typicality. The ‘multi-level measures’ make observable the individual components that contribute to a product design’s overall typicality, as well as atypicality – or novelty. Thus it provides a highly systematic approach to measuring typicality, as well as novelty – how it manifests within a product category, when it is preferred, and equally as important, when it is not preferred. This paper discusses the theory behind the ‘multi-level measures’, as well as the development of a set of highly controlled stimuli to test the proposed hypotheses.

\section*{Measuring Novelty Using a Multi-level Measure of Typicality}

When measuring product typicality and novelty, previous studies have presented exemplars of product categories, either consisting of existing products (Hekkert, Snelders, and Wieringen, 2003; Hung & Chen, 2012; Ward and Loken, 1988), or those that have been developed specifically for experimental testing. In the case of the former, pretesting of stimuli is often undertaken to determine a selection that falls into both categories of typical or novel. In the case of the latter, stimuli are developed to provide systematic deviations from the category prototype, varying in perceptual attributes such as curvature (Blijlevens, Carbon, Mugge and Schoormans, 2012) and visual complexity (Cox and Cox, 1994, 2002). In either case, what makes one product example more typical than, another or one curvature more novel and when? Would the same novel curvature be more desirable when paired with a novel colour rather than a typical colour or vice versa (Figure 1)?

![Figure 1: Toasters, typical and novel curves and colours.](image)
Mentioned previously, the novelty found in product designs will predominately be relative novelty, having some relationship to the previous experiences of a product category. As typicality is a cognitive means of measuring existing knowledge, and because related knowledge is proposed to be conceptually connected, understanding the typicality of related product category knowledge would seem essential to understanding how novelty manifests, as well as when and why it is considered preferential. For example, will features that are shared by products over a number of category levels be considered typical when found in a separate yet related category? Or will they be considered novel because they now exist in a new context? If so, would this novelty be successful in eliciting preferential appraisal, i.e. an instance of relative novelty?

The ‘multi-level measures’ method was designed to test such hypotheses. Grounded in Roschian category taxonomy and Prototype theory (Rosch, Mervis, Gray, Johnson, and Boyes-Braem, 1976; Rosch, 1999), it returns to the fundamentals of category representation, specifically focusing on the physical attributes used to vary product appearance i.e. shape, colour and texture. It investigates the typicality of each of these attributes across multiple levels of categorization, including the superordinate level (broad categorization e.g. furniture, animals, vehicles), basic level (identification categorization e.g. chair, dog, car), subordinate level (specific categorization e.g. armchair, Dalmatian, SUV), as well as object parts (seat, tail, tyre) and non-parts (wood, fur, rubber) (Tversky and Hemenway, 1984).

Tversky and Hemenway (1984) found that while object categories were represented by typical examples i.e. a chair is a typical item of the superordinate category furniture, these examples consisted of typical parts. For example, chairs consist of a back, seat and legs, and that certain parts were better representative of an object category than others e.g. a ‘screen’ is highly typical of a television or computer, whereas ‘buttons’ can be found in a number of object categories that are conceptually unrelated e.g. shirt, remote control, lift (Tversky and Hemenway, 1984). At the basic level of categorization, which is used to identify objects, parts are generally shared across all exemplars i.e. all chairs consist of the same parts. The variation in the appearance of basic level category objects occurs at the subordinate level, where specific exemplars are represented differently using non-parts (non-structural components e.g. wood, metal, and brown). An office chair for example shares the same parts as a dining chair, yet it will look very different because it is represented differently using non-parts. Office chair legs are typically made of plastic or metal, and often have wheels; dining chair legs are more typically made of wood. The way in which each part is represented provides important contextual information, which aids in identifying each exemplar’s appropriate context, function (Tversky and Hemenway, 1984), and it is hypothesized here, to influence aesthetic appraisal. If objects are subject to typicality, and so are object parts, then it is plausible that the non-part attributes of parts are subject to the same process. A change in typicality of one non-part attribute could result in the change of the object/product’s typicality as a whole. Figure 2 shows three examples of office chairs, all of which are comprised of the same parts, are the same colour, and of similar texture. However one component part, the back, varies in shape. This single variation is hypothesized to directly influence the typicality rating of the overall product.

This same concept is demonstrated once more using colour (Figure 3), whereby the shape and texture of the chairs are identical, yet the colour is varied. This variation is hypothesized to influence the product’s overall typicality.

Further complexity is confronted once the typicality of an individual part’s attributes is taken into consideration. Non-part attributes that are considered typical of one part shape, may be considered atypical for a different shape. As typicality is dependent on a number of factors, one of which includes frequency of exposure (Rosch, Simpson, Miller and Scott, 1976), associations between non-part attributes and parts may be learnt through repeated exposure (Miller, 2000), and as such the typicality of the part representation is based on previous experience. The maximization of product typicality may be dependent on maximizing typicality within the component parts and non-part attributes of which the product is comprised.
Prototype theory purports graded category membership whereby some features are better category members than others, and as such typical category exemplars exist. Further research has concluded that the same is true of object parts within object categories (Tversky and Hemenway, 1984). It is hypothesized here that this concept of graded category membership would also apply to non-part attributes in relation to parts. Measuring the category membership of features, including parts and non-part attributes over multiple category levels, is considered to demonstrate how they are used to represent product categories and define product typicality. In doing so, the ‘multi-level measures’ method is hypothesized to make observable the operationalizing of novelty through the atypicality of category membership. Thus, novelty is hypothesized to be the perceived atypicality within any one non-part attribute of an object part.

To construct the ‘multi-level measures’ method, a meta-analysis of Category Norms studies (Battig and Montague, 1969; Casey and Heath, 1988; Howard, 1980; Marshall and Parr, 1996; Rosch, 1975; Van Overschelde, Rawson and Dunlosky, 2004) was conducted, and 10 furniture products were selected to be used in an exploratory study of object typicality and categorization. The results of the study identified two basic level furniture products, (1) chair and (2) chest of drawers, and four subordinate level products, (1) office chair, (2) dining chair, (3) tallboy and (4) bedside drawers, to be used in a further exploratory study of part and non-part attributes. The four products were then deconstructed into two typical object parts each, to test the hypothesis of non-part attribute typicality. The office and dining chair parts included backs and legs, the tallboys and bedside drawers included the body (main frame) and drawer handles. As no existing typicality ratings were available for the appearance of individual object parts, a visual analysis was undertaken of existing furniture products available in the Australian market, categorizing object part appearance into high and low frequency categories. Using high and low frequency examples of each part, a set of 32 simple part shape vector illustrations was then created. A second exploratory study then followed to collect specific information of non-part attributes across all three levels of category taxonomy i.e. superordinate, basic and subordinate levels. A total of 20 participants took part in the study (mean = 38.8, 11 females), and the typicality rating of each non-part attribute, shape, colour and texture, was collected for each category level using Rosch’s original seven point scale, 1 being Not very typical and 7 being Very typical (Rosch, Mervis, Gray, Johnson, and Boyes-Braem, 1976). Texture properties included common materials used in furniture products, wood, plastic, metal, fabric, leather and glass. Colour properties were represented using focal colour swatches of common i.e. black and brown, and uncommon i.e. pink and green, colours used in furniture products. As the study’s primary focus was the category membership of non-part attributes, only typicality ratings were collected.

The results from the second study provided information of how individual non-part attributes such as shape, colour and texture are used to represent specific exemplars of an object category. For instance, certain product parts had strong associations with particular subordinate categories. Furthermore certain part shapes had strong associations to particular colours and textures. It was also observed that when the most typical of all three non-part attributes were combined, the results were highly typical exemplars of the category. As such, it is hypothesized that the stronger the association of a part shape to a category i.e. high typicality, the greater its influence on aesthetic appraisal, both positive and negative. Product parts that are highly typical in one subordinate category will be negatively appraised when transferred to another category. It is also hypothesized that typicality preferences at the subordinate level supersede those at the basic level. It is further hypothesized some product parts will be able to accommodate a greater variety, and more atypical properties than others depending on their individual representation. For example, chair backs can accommodate more varied properties than legs, and drawers handles more variation than drawer bodies. In addition to this, specific product parts appear to be required in order to achieve high category membership, with some parts requiring specific representation. For example the wheeled office chair legs were the only example to achieve high typicality as a part shape in the category office chair, and were represented quite specifically with black and plastic non-part attributes. This implies, firstly, that this wheeled leg may be a highly typical feature of the category, and as a result exemplars of office chair that include this feature are more likely to elicit preferential appraisal. Secondly, parts represent product objects, yet non-part attributes represent parts, and it is the representation of parts that is hypothesized to influence aesthetic appraisal; some parts have more predictive status than others, and the same may be true for non-part attributes.

These exploratory studies were conducted to investigate the visual representation or appearance of products, in order to determine what defines product typicality, and the operationalizing of novelty. As discussed previously, it is hypothesized that novelty is the atypicality of any one non-part attribute within a product part; hence a set of stimuli that could be systematically manipulated to test this hypothesis was required. The procedure outlined above made such stimuli and testing possible, by providing a set of typicality measures of non-part attributes for each of the four levels of categorization, hence the ‘multi-level measures’ method. With this method it is now possible to construct stimuli that have measured systematic manipulations, and to observe which factors contribute to product typicality and novelty. By testing the influence of the typicality on individual product components it is possible to observe how novelty manifests in a product category, when it is preferred, and if this preference has any relationship to other related category knowledge. Although it is hypothesized that the maximization of highly typical product features across multiple category levels would result in most typical exemplar of a product category, what is of particular interest is the point at which a product is deemed novel. Whilst the
MAYA principle purports that products require both typicality and novelty present in order to maximize preferential appraisal (Hekkert, Snelders, and Wieringen, 2003), it is posited here that not all novel instances are preferred. It is hypothesized that two types of novelty exist; one which elicits preferential appraisal, congruent novelty, the other which is perceived negatively, incongruent novelty (Tyagi, Thurgood and Whitfield, 2013). It is hypothesized that preferential novelty is more likely to be produced by an instance of atypicality that can be attributed to existing or related product category knowledge. For example, if a feature is deemed typical within the superordinate category, but atypical within basic level, or subordinate level, this atypicality at the latter levels may be viewed more favourably than a feature that is not attributed to the superordinate level (Tyagi, Thurgood and Whitfield, 2013).

Conclusion
Both typical and novel elements in products design may be required to elicit preferential appraisal; however, previous research of product typicality and novelty has not been able to explicitly account for the when, why and how each variable possesses the ability to positively influence appraisal, and why difference in categories exist. The concepts outlined here purport that products are the sum of their parts, and so too is their typicality. Products are comprised of parts, and these parts are themselves comprised of non-part attributes that are used to represent them. Hence, products categories such as chairs, cars and mobile phones are physically represented by parts, which are themselves represented by a set of perceptual properties, including shape, colour, texture and curve. For example, a car body is metallic, smooth and glossy, whilst the bumper bar is black and matte – the tyres, round, black and rubber; however, they collectively are viewed as a car. A specific set of non-part attributes are used to represent each one of the car’s parts as typical, hence creating a whole car that is considered typical. However, by representing only one of these parts atypically could then produce an instance in which the car as a whole could be perceived as being novel: for example, a car with red tyres or a purple body. Understanding which parts take priority in eliciting typicality or novelty perception, as well as the non-part attributes that achieve this, requires the typicality of a product category to be clearly defined.

Novelty has been regarded as a means to increase arousal levels, with moderate levels of arousal proposed to elicit the preferential response of stimulus; hence it is considered the ‘optimum’ level of arousal (Berlyne, 1971). It is hypothesized that this level is reached when a stimulus possesses new information or novelty that is related to existing knowledge. Although the knowledge may be new, it is new relative to the stimulus category in question, and if it is relevant to, and associated with, existing knowledge it may be more likely to lead to category expansion and facilitate learning. The Collative Motivation model posited learning as a key contributing factor to the role of novelty, as an increase in arousal levels led to the activation of the brain’s reward system once the novel instance had been resolved. If the novelty were in some way associated with existing knowledge, this resolution may increase arousal levels to the optimum level for the simple reason that it would viewed within the context of existing knowledge, and is therefore not deemed inadmissible. Under this proposal processing speed would not be significantly compromised as the physiological structure of the existing information would still be localized (Martin and Chao, 2001).

Novelty is therefore is hypothesized to be either the congruent or incongruent relationship between the perceptual and conceptual representations of a product category. Congruent novelty is the occurrence of atypicality that is related to existing knowledge within the category taxonomy. Conversely, incongruent novelty is the occurrence of atypicality that is not related to existing knowledge within the category taxonomy. These two instances of novelty are hypothesized to affect aesthetic appraisal differently, with congruent novelty more likely to elicit preferential appraisal for reasons previously discussed i.e. arousal potential and learning, as incongruent novelty is less likely to do so. This idea of learning facilitation is reflected in the UMA – Unified Model of Aesthetics – (Hekkert, in press), which proposes a tension between safety and risk, from which the aesthetic appraisal processes are hypothesized to stem. New or novel stimuli are less likely to pose a risk if they are related to some forms of existing knowledge, as opposed to entirely new stimuli not yet encountered. Incremental adoption of novel stimuli would enable further expansion of knowledge and the articulation of categories, whilst still preserving safety and minimizing adverse risk.

The role of novelty is an important factor in product design, particularly its relationship to typicality, which requires further investigation. The ‘multi-level measures’ method attempts to reveal the nature of this relationship. It endeavours to understand the role of category knowledge; not only of the category directly in question, but also related knowledge that could be used to situate both new and existing information into a new context to achieve positive affect and preferential appraisal.

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The Beautiful in Choreographies of Contemporary Dance: The Relationship of Dancers’ and Spectators’ Experience

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Abstract
This paper deals with the relationship of subjective experience of dance according to the criterion of the beautiful among dancers and spectators. The research was conducted in two parts. The first part involved six dancers of contemporary dance, who are students at The School of Ballet in Novi Sad. Each dancer performed three different choreographies of contemporary dance in front of spectators. Then, these dancers evaluated their subjective experience of dance according to the criterion of the beautiful on a seven-point scale. The choreography was used as a “live” stimulus, i.e., the participants performed the dance choreography. The performances the live choreography was recorded. Two weeks later, the participants watched their audio-visual recording of performed choreographies and then they made evaluations again. In the second part, there were 30 participants who were students of the Novi Sad University and they had the role of spectators. They observed the performance of three dance choreographies of contemporary dance, the same as in the previous part of the research, performed by six different dancers, so there were 18 choreographies in total. Having observed the choreographies live, the spectators evaluated their subjective experience of the dance according to the criterion of beautiful on the seven-point scale. After two weeks, the spectators watched the same choreographies on the recording and they made their evaluations again. The results show that between dancers and spectators, there are no significant differences in the assessment of subjective experience according to the criterion of beautiful neither when the dancers perform choreography and the spectators watch them nor when both groups of participants observe the performance on the recording. Although the assessments were based on two different mediums through which subjective experience of the dance according to the criterion of beautiful is perceived, there is a similarity between dancer’s and spectator’s experience of the dance, both when the dance is performed and watched live, as well as when it is perceived only through the visual sense. The implications of the obtained results are discussed within the context of two different mediums through which dance experience is perceived.

Keywords: dancer, spectator, choreographies of contemporary dance, beautiful.

The aim of this study was to investigate the relationship of dancer’s and spectators’ subjective experience of the choreographies of contemporary dance according to the criterion of the beautiful. Artistic dance, in general, can be defined as a system of organized and formalized movements that convey meaning which the artist consciously and deliberately expresses and transfers it to the observer (cf. Layson, 1994; Jowit, 1994; Carter, 1998; Blom & Chaplin, 2000; Meekums, 2005; Tufnel, & Crickmay, 2006).

Contemporary dance is understood as a form of artistic dance which appears as a renaissance of modern ballet (Koenig, 1980). Instead of being bounded by a set of standards or defined styles choreographers tend to introduce to the audience abstract ideas (Cerović, 2005). Innovations in contemporary dance can be identified through a different use of the body and its engagement, and through improvisation, minimization and abstraction (Cerović, 2005). In exploring new choreographic possibilities and the potential of the body, it uses techniques from both classical and modern dance such as improvisation, both strong and controlled legwork, floor work etc. (Scheff, Sprague, & McGreevy-Nichols, 2010).

There are two important specifics of dance that distinguish it from other artistic disciplines. One consists in the fact that dance is set in space and time, and it is defined by the spatial and temporal synchronization (Laban, 1960; McFee, 1992; Layson, 1994; Hutchinson-Guest, 1973; Brown Martinez & Parsons, 2006; Repp & Penel, 2004; Luck & Sloboda, 2009).

The other characteristic of dance consists in the fact that the dancer does not create in the same medium through which the audience receives his work (Arnheim, 1966). In dance, the body is used as an instrument and a dancer is at the same time both an "artist" and a "piece of art", or both the subject and the object of aesthetic experience. The subjective experience of dance choreographies according to the criterion of the beautiful will be considered within the context of two different mediums through which dance is experienced and perceived.

The Experience of the Dancer

In previously published work (Thomas, 1980; Glomer & Dupui, 2000; Montero, 2006; Hugel, Cadopi, Kohler, & Perrin, 1999 Fenemor, 2003; Mullis, 2006) the experience of dancers performing dance is connected with the role of proprioception, the role of the senses which inform us about ourselves, and therefore with the kinesthetic and vestibular sensitivity.

Since dancers evaluate the aesthetic quality of their movements mostly by the sensations in the muscles, tendons and joints that they have while performing, as well as by the sensitivity of balance and orientation, and since they are not able to use a mirror while performing, it can be assumed that visual sense is not dancer’s mainstay (Montero, 2006; Hugel et al., 1999).
The Experience of the Spectator

According to numerous studies which deal with the spectators' aesthetic experience of dance (Arnheim, 1966; Montero, 2006; Thomas, 1980; Hugel et al., 1999; Golomer & Dupui, 2000; Glas & Stevens, 2005; Stevens, McKechnie, Glass, Schubert, & Chen, 2007; Calvo-Merino, Jola, Glaser, & Haggard, 2008; Fenemore, 2003; Arnold, 2005; Turner, 2008), it can be ascertained (Vukadinović & Marković, 2012) that the spectators’ experience of dance may be defined as a case of indirect experience, that is, imagined participation or projection in the experience of observed dancers.

On one side, the experience of dance by the spectator, can be related with the mechanism of "mirror neurons" (Montero, 2006), which means that observation of dance can create "internal" experience as if the spectator himself was dancing (Cross, Hamilton, & Grafton, 2006; Calvo – Merino, Glaser, Grezes, Passingham, & Haggard, P. 2005; Calvo-Merino, 2009).

On the other side, the spectators’ experience of dance can be related to a number of factors that affect it (Stevens, McKechnie, Malloch, & Petocz, 2000; McKechnie, 2002; Glass & Stevens, 2005), such as visual elements, characteristics of dancers, movement, choreography, interpretation, emotional recognition, novelty, spatial dynamics, intellectual and emotional stimulation and prior experience.

Given the fact that dance is a unique art discipline because dancers use kinesthetic sense in the act of performing a certain choreography, while the audience receives their work through the visual sense, the aim of this study was to investigate if there is a relationship between dancers and spectators in the subjective experience of dance choreographies according to the criterion of the beautiful.

Method

The aim of the research was to investigate the subjective experience of dancers while performing different choreographies of contemporary dance. Also, whether there are statistically significant differences in the dancer’s assessment by the criterion of beautiful when they dance choreography live, and when they watch themselves while performing through recording and evaluating their experience.

The second aim of this study was to investigate spectators' subjective experience by the criterion of beautiful while watching different choreographies of contemporary dance. Also, if the spectators' judgements by the criterion of beautiful are influenced by the dancer who performed the choreography. In addition, the objective of this research was to investigate if there are differences in the experience of dance when spectators viewed choreography live or via video.

Participants

Dancers. There were six dancers, who were students on the department of contemporary dance in Ballet School from Novi Sad.

Spectators. There were 30 third-year students from Faculty of Philosophy in Novi Sad who took part in this research. There were 8 male students and 22 female students (mean age = 22.3 years). The participants didn’t have any direct experience with dance training. Students participated voluntarily and they didn’t receive course credit nor a fee.

Stimuli

Stimuli consisted of three different choreographies of contemporary dance, danced by six different dancers. There were 18 choreographies in total. Three choreographies of contemporary dance, different in character and dynamics, were created by choreographer and head of the department of contemporary dance in Ballet School in Novi Sad, Aleksandra Ketig.

The first choreography was made to the music by Philip Glass "Morning passages", the second choreography was made to the music by Maxence Cyrin "Don’t you want me", while the third choreography was made as the musical improvisation by Mina Cvejić on the theme by Philip Glass "The Poet Acts". All choreographies were presented in the ceremonial Hall of the Ballet School in Novi Sad, with piano accompaniment by Mina Cvejić. In the study the same stimulus was used in two different ways. On the one hand, the choreography was used as a stimulus "live", i.e. each of 6 dancers performed all 3 choreographies. The performances were recorded. On the other hand, the stimuli were used as a recording of these live performed choreographies.

Instrument

Subjective experience of dance according to the criterion of the beautiful was measured on the seven-point scale. The task for the dancers was to assess all tree choreographies they danced by the criterion of beautiful on the seven-point bipolar scale. The scales ranged from -3 (ugly) to +3 (beautiful). The task for spectators was to assess all 18 choreographies they watch by the criterion of beautiful on the seven-point bipolar scale. The scales ranged from -3 (ugly) to +3 (beautiful).

Procedure

The research was conducted in two parts. The first part involved six dancers of contemporary dance, who are students at The School of Ballet in Novi Sad. Each dancer performed three different choreographies of contemporary dance in front of the spectators. Then, these dancers evaluated their subjective experience of dance according to criterion of the beautiful on the seven-point scale. The choreography was used as the stimulus "live", i.e., the participants performed the dance choreography. Performing the live choreography was recorded. Two weeks later, the dancers watched their audio-visual recording of performed choreographies and then they made evaluations again. In the second part, there were 30 participants who were students of Novi Sad University and they had a role of spectators. They observed the performance of three dance choreographies of contemporary dance, the same as in the previous part of the
research, performed by six different dancers, so there were 18 choreographies in total. The second part of the research was carried out in two phases. In the first phase, having observed the choreographies live, the spectators evaluated subjective experience of the dance according to the criterion of beautiful on the seven-point scale. In the second phase, after two weeks, the spectators watched the same choreographies on the recording and, after each observed choreography, they made their evaluations. The choreographies were presented by a video projector in the form of a visual and auditory recording according to the balanced order established beforehand. The participants observed the recordings in groups, and having finished watching each recording, they immediately made assessments. The participants were told to direct their estimations of beautiful to the dance movements. The time allotted to the assessment after seen choreography totaled one minute.

**Results**

**The Assessments of Dancers**

The results show that there are no significant differences in the assessment of subjective experience of dance according to the criterion of the beautiful when dancers are performing the choreographies and when they are observing the performance of the choreographies on the recording.

**The Assessments of Spectators**

The significance of the medium effect is confirmed \( F (1, 29) = 12.814, p < .001 \). The results show that the spectators assess the subjective experience of dance according to the criterion of beautiful with significantly higher values when they observe the choreographies live \( (M = 5.54) \) than while watching it on the recording \( (M = 5.11) \).

Also, the significance of the choreography effect is confirmed \( F (2, 58) = 31.240, p < .000 \). Least Significant Difference test shows \( (p < .000) \) that the first choreography \( (M = 4.81) \) significantly differs according to the assessed criterion of beautiful from the second choreography \( (M = 5.50) \) and from the third choreography \( (M = 5.59) \), whereas the second and third choreography do not differ significantly.

The significance of the dancer effect is also confirmed \( F (5, 145) = 33.173, p < .000 \). The results show that the spectators, when watching each of 6 dancers performing, assess the subjective experience of dance according to the criterion of beautiful with significantly different values.

The analysis showed a statistically significant interaction between the medium and dancer \( F (5, 145) = 3.371, p < .007 \). The interaction between the medium and dancer suggests that there is a different distribution of assessments according to the criteria of beautiful depending on the medium (live performance or watching performance on the recording) and the dancer performing the choreographies of contemporary dance.

Also, the analysis showed a statistically significant interaction between the choreography and dancer \( F (10, 290) = 7.716, p < .000 \). The interaction between the choreography and dancer suggests that there is a different distribution of assessments according to the criteria of beautiful depending on the choreography performed and the dancer who is performing the choreography of contemporary dance.

**The Assessments of Dancers and Spectators**

Results of paired samples Test showed that between dancers and spectators, there are no significant differences in the assessment of subjective experience according to the criterion of beautiful neither when the dancers perform choreography and the spectators watch them nor when both groups of participants observe the performance on the recording.

**Discussion and Conclusion**

The results showed that the assessment of the subjective experience of dance, according to the criterion of the beautiful when dancers are performing the choreographies and when they are observing the performance of the choreographies on the recording do not differ significantly. Based on this result, it can be assumed that the medium through which the dancers receive their experience of beautiful, does not influence significantly their experience of the performed dance choreographies. This result can be explained by the findings of previous studies (Hugel et al., 1999; Hagendoorn, 2003). Although in the beginning of the exercise when practicing certain movements, the dancers use a mirror, usually, for self-correction, and therefore they rely on the visual sense, proprioception of the movement as other important sensory modality plays a key role in the practice of dance activity (Hugel et al., 1999). Dancers rehearse a specific movement until they begin to proprioceive a “good feeling” when they perform (Hagendoorn, 2003), which will serve as the main basis of their aesthetic experience in performance before an audience (Hugel et al., 1999).

Concerning the spectators’ subjective experience of choreographies by the criterion of beautiful the results showed that their assessments are significantly higher when the choreographies of contemporary dance are seen live. Also results showed that there are significant differences concerning choreography which is performed, and the dancer who is performing. These results indicate: 1) the importance of direct experience in the spectators’ evaluation of dance choreographies; 2) the importance of specificity of expression of specific artists; 3) the importance of specific choreography within a certain dance form.

Mostly these results were expected because it was suggested in previous studies (Glass, & Stevens, 2005; Stevens, McKechnie, & Malloch, & Petocz, 2000; Stevens, McKechnie, Glass, Scuhubert, & Chen, 2007; Vukadinović, 2008, 2010) that the subjective experience of dance is influenced by objective factors such as the medium of observation – whether the dance is observed live or via audio-visual recording; the particular expression of specific dancer – the same choreography performed by various dancers; specific choreography within a dance form.

In general it can be concluded that the results of this study confirm the idea (Glass & Stevens, 2005 Stevens,
McKechnie, Malloch, & Petocz, 2000; Stevens, McKechnie, Glass, Scuhubert, & Chen, 2007) that factors such as choreography and the characteristics of the dancer influence the subjective experience of dance for the audience. Based on the results of this study and the results of previous studies (Vukadinovic, 2008, 2010), we can conclude that this idea can be amplified with another factor, and that would be a factor of the medium, i.e., whether spectators are watching a dance performance through recording or live.

Although the assessments were based on two different mediums through which subjective experience of the dance according to the criterion of beautiful is perceived, there is a similarity between dancer’s and spectator’s experience of the dance, both when the dance is performed and watched live, as well as when it is perceived only through the visual sense.

On one hand, these results, indirectly and in the context of dance, could speak in favor of idea of “mirror neurons”, by which the observation of dance can create an internal impression as if the spectator himself was dancing (Montero, 2006; Cross et al. 2006; Calvo – Merino et al., 2005; Calvo - Merino, 2009). Various studies have shown that certain parts of the brain are active when a person passively watching the dance (Calvo – Merino et al., 2005; Cross et al., 2006), as well as when making aesthetic assessment of the dance (Calvo-Merino et al., 2008; Kawabata & Zeki, 2004).

On the other hand, it has been argued that the nature of “mirror neurons” is rather contentious (Dinstein, Thomas, Behrmann, & Heeger, 2008), and that in the case of dance performances the mechanism of “mirror neurons” is not applicable to the perception of concurrent movements of multiple dancers and to our understanding of the simultaneous pushing and pulling in a duet (Hagendoorn, 2009, 2011). Hagendoorns’ (2009) suggestions are based on the results of the various experiments which have shown that there is an upper limit to the number of objects that one can simultaneously track (Cavanagh & Alvarez, 2005; Alvarez & Franconeri, 2007).

On the basis of previous results and discussion it can be concluded that, despite the fact that the assessments are based on two different mediums through which participants of this study experienced the choreographies of contemporary dance, the absence of statistically significant differences in assessments between the dancers and the spectators, indicates the similarity of their experience of dance that arises, largely, from proprioception of dancers and, for the most part, from exteroception and visual sense of the audience.

References


On The Possible Effects of Body Contact in Ensemble Singing

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Abstract
The current paper describes a musical experiment inspired by historical sources. An a-capella-ensemble of six singers performed Renaissance compositions while carrying out several forms of body contact as depicted in period miniatures. Qualitative and quantitative data were collected to explore whether body contact may have served as a functional factor in choir performances. Findings and hypotheses pointing towards two different effects (improvement of performance quality and deepened communal feeling) were analyzed in the framework of physiological interaction and social psychology. Finally, the experiment is interpreted as a first step towards adapting methods of experimental archeology and historical re-enactment for use in the field of empirical aesthetics.

Keywords: ensemble singing; choir singing; effects of touch; music pedagogy; interpersonal action coordination; social interaction.

Introduction: Pictorial Traces for a Historical Performance Practice?

The 14th and 15th centuries witnessed the “Rise of European Music” (Strohm 1993): The composition and performance of polyphonic music increased immensely as it spread throughout Europe, and became integrated into the exchange of cultural, social, and economic capitals by the secular and sacred elites (Pierre Bourdieu’s terms). The medium and main protagonists of the burgeoning practice were the choirs of cleric-musicians in cathedrals, collegiate churches and court chapels. During the 15th century those bodies gradually changed into professional music ensembles, members of whom had undergone special training (Lütteken 2011, 70–93, Perkins 1999, 50–104). Institutionalization and professionalization went hand in hand with an emerging self-awareness: that of being a musical elite increasingly documented in the form of, for instance, author ascriptions in music books or sets of motets and chansons where composers were explicitly named (or musically quoted).

Another instance of this development may be seen in the rich variety of book illustrations representing chapel choirs or pre-modern chapels. Typically, we see a group of 4 to 15 male persons including choirboys and adult singers of different ages and clerical ranks. All of them stand very close to each other and gather around a single music book of plainchant (to be chanted or embellished with improvised counterpoint) or polyphony. Already unusual enough in comparison with modern performance practices, many of the illustrations display an even more striking detail: that of singers putting their hand on the shoulder or the head of the singer in front of them or putting their arms around their neighbour’s shoulders (the ordinary way would have been to cross the upper arms before one’s breast, sometimes even under the mantle).

Surprisingly, however, the issue of body contact in ensemble singing has until now failed to raise the attention of scholars of performance practice and musical iconography. With regard to performance practice, only a few researchers explicitly advocate a literal understanding (Smits van Waesberghë 1966), interpreting body contact as a means of non-verbal interpersonal communication (Bowles 1977, 118). Often touch is related to the concept and etymology of “tactus” which implies not continuous contact but periodic tapping (for which additional textual evidence exists, Frobenius 1972).

Art historians, however, would warn us not to naively take pictures of that (or any) era literally. Even though some of them form part of chronicles or music manuscripts and prints, a fact that would seem to allow for a documentary understanding, most of them serve as illustrations in books of hours, psalters, or treatises, depicting idealized or even angelic ensembles rather than human ones. That a literal understanding is neither necessary nor sufficient for interpreting these pictures has recently been demonstrated in an extensive iconographically oriented article by the art historian and musicologist Björn Tammen (2013).

As often occurs in cases of incomplete evidence, the question seems to have to remain unresolved and historians can only propose equally plausible hypotheses. It nevertheless seems worthwhile to ask if pre-modern chapel choirs used touch in their practice and if so, why. The answer to these questions would not only contribute to the knowledge of music historians, but could also prove fruitful for performers and music pedagogues on the one hand and psychologists interested in interpersonal interaction, group identity or social bonding by means of touch, on the other.

To this end, a team of music historians, systematic musicologists and psychologists joined forces with a semi professional a-capella-ensemble to venture a rather unusual musical experiment: Inspired by the theories and practices of historical re-enactment (Collingwood 1946; see also Dray 1995) and experimental archeology, we resolved to take the pictures at their words and reconstructed as carefully as possible a performance situation identical or similar to the assumed historical one. In so doing, we expected to gain...
some insights into whether singing together in this manner has (and therefore could have had) any effects at all and if so, what the nature of these effects is (or could have been).

Figure 1: Miniature illustrating the lemma “Cantus” in the Tacuinum sanitatis; Ms. Rome, Biblioteca Casanatense Ms. 4182, p. CCIII (c. 1390).

Figure 2: Woodcut illustration in Franchino Gaffori: Practica musiceae (Venice 1512).

Figure 3: Miniature at the beginning of Psalm 150, Grande bible historiale complétée (1395–1401), Maître du livre d’heures de Johannette Ravanelle, Paris, Bibliothèque nationale, Ms. fr. 159, f. 277v.

Figure 4: Left panel of the Cantoria (choir pulpit; marble; 1430s) of Luca della Robbia, Florence, Museo dell’Opera del Duomo.
Methods

Historical: Deducing Hypotheses from Iconographic and Notational Evidence

Before embarking on the experiment, a careful examination and interpretation of the iconographic information as well as the practices the music books forced on their readers was needed. To begin with the latter, it is clear that the custom of singing from only one book, set on an elevated music stand, resulted in a rather closed, if not cramped, positioning of the singers with the younger (and smaller) ones in the front row and the taller ones in the back rows. Even for the standard setting with crossed hands we may assume a high degree of contact with regard to the entire body surface. The singers would necessarily have felt the breathing of their neighbors together with their other movements, more or less unavoidable, when performing the act of singing.

Since all singers would have focused their visual attention on the book, their actions could not have been synchronized by a conductor (a function that did not exist until well into the 17th century). In some cases, especially during the choirboys’ lessons, the choirboys’ master or one of the older singers standing at the end of one row would indicate entries, beat, and errors if there occurred any (on duties of the praecentor see Smits van Waesberghe 1966). However, synchronization – the fundamental factor in every musical performance – could not have been deduced entirely from the book: Regardless of whether the choir had to chant or to perform a polyphonic composition, neither the square notation for Gregorian chant nor the mensural notation for polyphony offered exact information as to the temporal execution of the piece. Polyphony was even harder to synchronize since the different voices were not yet arranged in score but displayed separately in blocks (see Figure 5). While reading his own voice no singer could tell what the other voices were supposed to be singing at that same moment. Additionally, text underlay was usually anything but clear. If two or more singers performed one voice, they had to somehow decide on when exactly a new syllable should start. Two possible strategies of coping with those difficulties seem plausible: extensive rehearsals or another means of ad-hoc interaction and communication during the performances.

With regard to the iconographic evidence, it is first of all necessary to acknowledge that the miniatures show performances of plainchant as well as of polyphony (if it is possible to tell the difference at all) and present the choirs as a “psycho-physical unity” (Smits van Waesberghe 1966, 1349). Further, various forms of touch appear: besides putting the hand on the shoulder of the singer in front or around the neck of a neighbor, hands are also put on the head of a boy and people use their hands to touch the music book or share in holding it. Most of the touches seem to be continuous. However, if it was intended to indicate the act of mensurating, the fingers are explicitly shown tapping.

The two main types of touch are strongly related to experience and seniority of the singers: The motif of the hand on the shoulder occurs only between older and younger singers. This might have practical reasons since it allows placing the hand at a rather convenient height. Yet, as Tammen (2013) argued, elements of fatherly protection, guidance as well as disciplinary control might also be at stake. In contrast, the contacts between persons of the same age bear an air of community, friendship and familiarity. That would point to a twofold social interpretation of touch: On the one hand it seems to serve a pedagogical function, on the other hand it is an expression of the corporate identity of a body of professional singers who – due to their status as clerics – not only sang with each other but lived in close communion.

The examination of the iconographic and musical sources therefore leads to several preliminary hypotheses: 1) that touch as well as body contact may serve as a means of interpersonal communication and action coordination that complements auditory feedback and compensates for the absence of other means of verbal and visual communication; 2) that the touch of a singer of higher expertise might help a singer of lesser expertise to stay synchronous with the others and to master difficult rhythmical tasks; 3) that close contact between singers of the same age intensifies feelings of social bonding and communal feeling.

These hypotheses are in accordance both with recent studies of the effects of singing together (in unison) on physical synchronization (Müller & Lindenberger 2011)
and with sociopsychological research on touch (e.g. the review of Herstein et al. 2006 on communicative functions of touch; de la Riva 2010 on the influence of touch in consensus-building; Field 2010 on effects on socioemotional and physical well-being). In addition, a recent experiment demonstrated that we might be able to perceive and recognize certain elements of music by vibrotactile stimulation alone (Russo, Ammirante, & Fels 2012).

Experimental: Re-enacting the Renaissance Chapel Choir Experience

Guided by examination of the most representative pictures, a performance situation for a 6-person ensemble (two female and four male singers) was created that included the factors room (a medium sized church with good acoustics), notation format and presentation (facsimilia of music manuscripts of the 15th and 16th century), positioning of the singers (two rows) as well as competence differences (singing experiences ranging from near-to professional to good dilettante). Five of the six singers had met already for more than 2 years, so we could assume them to have developed at least an average degree of group identity.

The experimental team not only ran the experiment but also acted as observers. The four team members were experts in either auditory analysis, the evaluation of performed music or in Renaissance music conventions.

The experiment was designed to investigate the effect of touch on performance quality (ratings of singers and observers) as well as social bonding (singers only). Four pieces were selected in total. Yet, to have some modulation of structure and potential difficulty we selected homophonic as well as polyphonic pieces. The pieces were sung two times each with and without touch resulting in two sessions with 12 takes each (including 4 training takes that were excluded from analysis). The order of touch and musical structure was completely balanced, keeping balancing equal across sessions. To allow for the recovering of the voices, the sessions were separated from each other by a sufficient break.

Quantitative data were obtained by means of questionnaires that had to be filled after every track, one by the singers and another one by the observers. The concepts addressed in the singer’s 10-item questionnaire were performance quality (3 items), flow (6 items), and social bonding (1 item). The observers rated quality on the dimensions quality, fluency, synchronization and balance (4 items). Both questionnaires used a 7-point rating scale ranging from absent/low to high.

Qualitative data consisted of observation protocols by two of the experimenters, additional remarks in the singer’s questionnaires, and individual in-depth interviews of the singers subsequent to the performing sessions. These data were analyzed hermeneutically and triangulated with the historical evidence and quantitative data.

In addition, the musical output was recorded with professional multichannel recording equipment taking a separate recording of every singer (with unidirectional headset-microphones) as well as an ensemble recording (with an A-B stereo setup) for planned audio analysis, which is not part of this manuscript. For documentary purposes, pictures of the respective positionings and some exemplary videos were shot.

Results

Every data set was first analyzed separately. Self-reports, observations and interviews yielded preliminary results that could be combined to second-level hypotheses that will be (partially) cross-tested with quantitative audio analysis in a future step.

Questionnaires

To begin with the questionnaires, the items addressing performance quality proved to be of high inter-personal consistency. Furthermore, visual inspection of an item analysis showed high consistency across the items in both questionnaires separately. Therefore, we decided to build the mean across all items belonging to one questionnaire as representing the overall musical quality. As an exception, we analyzed the item on social bonding separately (singers only). Note that the numbers of subjects for both questionnaires were small, precluding reliable analysis by a within-subject design. Instead, each mean for each participant was entered into a between-subjects design of a t-test, grouped by touch/no touch. Again, the small number of subjects precluded the inclusion of more factors into statistics (e.g., pieces).

![Figure 6: Mean quality ratings per piece and condition (singers). Bars depict standard deviations.](image)

Results were clear cut: Touching did not affect quality ratings. The factor touch was neither significant for the overall musical quality rated by the singers, \( t(94) = .17, p = .866, \eta^2 = .003 \), nor by the observers, \( t(62) = .20, p = .841, \eta^2 = .001 \). The singers rated the mean overall quality
without touch to be around 4.6 (standard deviation [SD] was 1.19) and with touch to be around 4.7 (SD = 1.36). The observers rated the quality slightly higher, without touch to be around 5.02 (SD = 0.98) and with touch to be around 5.0 (SD = 1.18). No significant difference between the takes with touch and without touch could be found for any of the pieces (Figures 6 and 7).

In contrast, we found a solid effect on social bonding (answers to the item “Ich fühlte mich mit den anderen Sängern verbunden” [I felt connected with the other singers]; see Figure 8), \( t(94) = 3.34, p = .001, \eta^2 = .106 \), with a mean rating of 4.40 (SD = 1.27) of experiencing the bonds when singers did not touch and 5.31 (SD = 1.42) when they did. Three of the four pieces were rated significantly higher under the touch than under the no touch condition. The same effect can be shown by the differences of means of two subsequent events given a change of condition. The condition of no touch occurring after touch produced a change of mean ratings from -0.7 to +1.4. When singers touched again after two takes of no touch, however, the means of their feeling of mutual bonding increased between +1.5 and +2.4 demonstrating a clear and very relevant behavioral effect.

Notes and Interviews

The picture was further differentiated by the qualitative data. All of the singers commented positively on the touch conditions: indeed not only did they perceive a difference but they ascribed a number of positive effects to it.

In the questionnaires, four of the six singers included ten notes that addressed different aspects of touch. Bringing them into order would result in three sub-aspects being identified: 1) What is perceived? nervousness, (joint) breathing; 2) Effects on perception of other singers: due to the closeness and touch they got better auditory feedback even from remote standing singers, or – negatively put – errors from someone else disturb even more; 3) Effects on performance ease: a bond with the person who sings the same voice makes own performance easier or even better, being touched by three of the singers resulted in an intense feeling of safety.

The interviews allowed us to get an even more detailed description of what the singers felt and thought was going on during the two conditions. The overall reaction towards the touch condition was positive, sometimes even enthusiastic. Their statements could be ordered in the following way:

1) What is perceived? movement and pressure of the touching hand (e.g., tremble due to nervousness), body vibrations and resonance (of touching and touched person), body tension (esp. when increasing shortly before a new voice entry or during an ascending phrase), breathing.

2) What is felt? moods and sentiments (general and with regard to the ongoing singing), nervousness, insecurity as well as confidence, mutual relationships and strong social bonding.

3) What is facilitated (polyphony)? timing, intonation, articulation, acoustical feedback, creating a homogenous sound, dynamics (getting louder or softer).

4) What is facilitated (homophony)? simultaneous syllable changes (in cases of ambiguous text underlay), rhythmic coordination, coordination of breath.

In short, the singers did not only perceive the fact of touching or being touched but they ascribed several positive effects to it. These effects applied to technical aspects of singing, mainly matters of joint interaction such as timing, sound shaping and interpretation, but also social aspects of being an ensemble. Interestingly, the non-effect of touch on performance quality that appeared in the questionnaires was not confirmed by the interviews. Instead, the participants had developed rather precise opinions on the positive roles touch could play to facilitate and enhance certain aspects of a performance.

The clues the singers gave should be taken seriously: Not only are the singers to be seen as experts in the matter at hand, but we rely on their statements and opinions.
precisely because the targeted effects more or less belong to the realm of inner- and intra-subjective experience. Yet, many of their comments might prove to be testable. The idea that touching between voice partners helped the weaker part to perform better should result in a clear difference in the recordings. The same goes for the reports of more synchronous syllable change, quicker adaption to a change in dynamics or articulation, and homogeneity of ensemble sound. Automatic sound analyses of parameters such as intonation, synchrony and intensity (to be carried out soon) should yield relevant results.

**Discussion**

Taking together two of the three data types obtained during the experiment, hypotheses deduced from the images as well as the existing research literature on effects of touch and body contact seem to be of at least some testable plausibility and validity. The first preliminary hypothesis (that touch as well as body contact serve as a means of interpersonal communication and action coordination) was affirmed by the interviews, although not by the quality ratings of singers and observers. That the questionnaires pointed towards the null hypothesis, however, was not least due to a training effect: The performance quality increased tremendously during each session, notwithstanding the touch or no touch conditions.

Notes in the questionnaires as well as passages in the interviews as well document the training effect: The pieces had not been sufficiently rehearsed beforehand. Moreover, the fascimilia contained some wrong readings that made the correct execution of the passages affected even impossible. And since not every singer could read from the mensural notation with the same ease, the ensemble sometimes spent more time on deciphering and learning the pieces than on actually performing them. The recording situation, unfamiliar to most of the singers, further contributed to these uncertainties.

As a consequence, the quality items on our questionnaire were not able to bring about reliable ratings on the effects of touch on the overall performance quality. Too many other variables affected that issue. However, the qualitative data shed at least some light on punctual effects of touch, even if they were not rated large enough to significantly affect the quality ratings. That may point to the idea that body contact only starts to have a distinct effect on performance quality when no fundamental technical problems interfere any longer and every singer knows his voice well enough to be open to the influence of touch.

The second preliminary hypothesis (that the touch of a singer of higher expertise helps a singer of lesser expertise) was also confirmed by the qualitative data. The third hypotheses, however, (that close contact between singers intensifies feelings of social bonding and communal feeling) was corroborated by the quantitative as well as the qualitative data and proved to be an especially strong effect.

It might be deduced from these preliminary results that the facilitating of interpersonal action coordination and the increase in social bonding are mutually related not only because they share the same cause – one of the phylogenetically and culturally most important body parts, namely the hand – but also because they occur in a musical situation. Music as text as well as practice is in itself of high social relevance and an exemplar of the pleasure and beauty that lies in coordination, coherence and harmony.

In addition, our experiment showed some explanatory power as to how these effects might be evoked. The comments of the singers addressed physical details (what was perceived) as well as subjective feelings caused by touch that are in accordance with each other. Further experiments can now be planned that try to single out effects on quality and singing pedagogy or that try to make the tactile information mediated by touch and body contact measurable and quantifiable.

“Very deep is the well of the past. Should we not call it bottomless?” This famous quote of the beginning of Thomas Mann’s epic novel *Joseph and his Brothers* is generally held to articulate the fundamental problem all historical research and imagination must face. However, neatly devised and historically informed experiments might bring shed at least some light on obscure parts of the well. Transferring Collingwood’s idea of re-enacting history from the purely imaginative to the practical field, however, will certainly work best where areas like crafts and techniques are concerned that mostly concern aspects that have neither changed since then nor are (much) affected by period interpretation or *Zeitgeist*. As soon as matters of the mind are at stake – be it with regard to emotions, opinions, sentiments or concepts – such an undertaking could become extremely difficult if not dishonest.

The experiment reported here, however, touched on both spheres: As regards the technical problems of performing together from chant or mensural notation, results of a practical re-enactment should come rather close to the historical “truth”. The same goes for the physical aspects of body contact and touch: What an object with the physical properties of a hand is able to transmit, and also the information that can be gained from close bodily contact today, are the same as in the past and can therefore be reliably measured. The feelings, however, that go along with these physical effects, are at least modulated by the historical and sociocultural context in which they occur. If an experiment shows such subjective results, as ours has done, it is again the historian’s responsibility to try to integrate these findings into his or her historical data: By comparing and interpreting sources of various origins he can discover if there is a historical analog to the (emotional or conceptual) construct at hand, if people reported similar
feelings in similar situations, and finally how that was appraised and conceptualized. If, finally, historical conscience and carefulness do not oppose the idea of congruity, we might have successfully re-enacted a portion of a once obscure and ambiguous past.

Appendix

The following pieces were sung in the experiment: 1) Pierre de la Rue: Kyrie from the Missa Al(e)mana (polyphonic), 2) Antoine Busnoys: “Fortuna desperata” (homophonic), 3) Heinrich Isaac: Pleni from the Missa Virgo prudentissima (polyphonic), 4) Johannes Prioris: “Consummo la mia vita” (homophonic)

References

Installation Art and Experiential Aesthetics: Mediating Art History and Neuroscience Research

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Abstract
In this paper I interrogate neuroaesthetics and its focus on traditional art forms and standards of beauty as the conduits for aesthetic engagement and reward responses. What neuroaesthetics has not explored is the transformational experience encountered in contemporary Installation art. However, as scholars of Installation art have argued, Installation art’s viewer is immersed within an embodied sensorial experience. What these scholars do not address is how cognitive and neural effects mediate transformative aesthetic experience. Focusing on Brazil’s outdoor museum, Inhotim (Brumadinho, MG), and its collection of Installation art displayed in its botanical gardens, I propose a revision of neuroaesthetics, what I call “experiential neuroaesthetics.” To this end, I have integrated models from both humanities and science which address a wider spectrum of aesthetic and affective responses, namely, defamiliarization, rupture, confusion, and anger. This approach raises an interesting question for future scientific experiments: Can we map the brain’s response to aesthetic rupture and the coincident spatio-temporal dynamics of transformative aesthetic experience?

Keywords: neuroaesthetics, art history, contemporary installation art, affect theory, cognitive poetics.

Introduction
This exegesis begins with definitions of terms that unify my approach to Installation art as a specific example for modeling experiential neuroaesthetics. As a contemporary art form, Installation art is “created especially for a particular gallery space or outdoor site, and it comprises not just a group of discrete art objects to be viewed as individual works but an entire ensemble or environment.”42 I speak of an “aesthetic of rupture” which pertains to the Installation artwork as object or artifact. More broadly, an “experiential aesthetic” pertains to the viewer’s physical and emotional transitions as s/he navigates the spatial-temporal dimension of Installation art works. An experiential neuroaesthetic pertains to the subject’s visceral and affective transformation, including pre-conscious and cognitive processes. Unless otherwise noted, I use “visceral” in the metaphorical, not anatomical, sense.43

A brief excursion through Inhotim demonstrates these concepts. Here, one alternately passes through open, landscaped spaces and enclosed spaces of installation pieces, each set within a unique pavilion or landscape clearing. Immersed in these works, we engage with the defamiliarization of familiar objects, sounds, and spaces. Leaving the installation site, we re-enter the gardens, but now transformed by our internal reflections upon the ruptured aesthetic experience that each installation compels. Given these multisensory stimuli, I propose that Inhotim provides a unique environment in which to examine transformative aesthetic experiences as part of an expanded database for neuroaesthetics research.

It was during my field research at Inhotim that I began investigating neuroaesthetics as a means of substantiating real-time and real-body transformations as part of modern and contemporary art aesthetics.44 As an art historian, I was thwarted by both the science and the aesthetics of published research. Laboratory-based experiments, using computerized monitoring and imaging devices, were limited to registering the immobile subject’s brain activity while viewing reproduced images of art. For over a decade since the founding of neuroaesthetics, researchers limited their studies to “the neural bases of beauty perception in art” (Di Dio & Gallese, 2009, p. 682) and contingent pleasure and reward systems. Installation art’s aesthetic of rupture transgresses beauty and problematizes “reward”. While scientists are just beginning to address neural responses to dissonance and the difference between beauty and non-beauty, art historians are slow to follow suit.45 To date, art historian D. Freedberg and neuroscientist V. Gallese remain trailblazers in applying scientific research to art history, but they have generally followed the pleasure/reward model.

Beginning in 2007, Freedberg and Gallese adapted the mirror neuron model to identify “the relationship between

45 An exception is G. Minisalle, (2013), The psychology of contemporary art. (Cambridge, United Kingdom: Cambridge University Press). Minisalle, an art historian, argues that while recent studies in neuroscience and psychology have shed light on our sensory and perceptual experiences of art, they have yet to explain how contemporary art downplays perceptual responses and, instead, encourages conceptual thought (p. xvii).
embodied empathetic feelings in the observer and the representational content of the works in terms of the actions, intentions, objects, emotions and sensations depicted in a given painting or sculpture (p. 199). Based on their historical art samplings, Freedberg and Gallese contend that the viewer is rewarded by embodying and, thereby, becoming unified with the painted figures’ movements and emotions. Notwithstanding its viability for traditional art forms, the principle of mirror neurons is irrelevant to my project. Aside from video installations, human figures are absent from Installation art, thereby precluding empathetic responses and mitigating reward. Furthermore, in Installation art the viewer’s own corporeal movement (rather a static “Other”) activates his physical and psychic responses.

**Empirical Descriptions**

We will now look more closely at individual Installation art works through the lens of affect theory and its offshoot, bloom space. With these models, we can map the embodied-spatial-temporal dimension of our encounters with Installation art, using a descriptive discourse with minimal loss of the lived event. In this section, I discuss experiential aesthetics as a foundation to experiential neuroaesthetics. As explained in The Affect Theory Reader, affect refers to the contact zone that registers all phenomena external to the self, whether material or immaterial, and leads to internal self-transformations. As such, the affect model accommodates the open-endedness and indeterminacies encountered in Installation art. Installation art also manifests our permeability with its objects, spaces, and sounds; a condition consonant with affect. While these affective conditions resonate in all the Installation works at Inhotim, Hélio Oiticica and filmmaker Neville d’Almeida’s Cosmococa and Doug Aitken’s Sonic Pavilion present opposite ends of the affective spectrum.

*Block-experiments in Cosmococa—Program in Progress, 1973–74* comprises five room-sized environments—or “block experiments”—that occupy a single building at Inhotim. In these rooms, the artists installed swimming pools, hammocks, Styrofoam floors and objects, sand, and balloons, and they immersed the visitor in a simultaneous mix of music and projected images of 1970s pop culture icons on the walls and ceilings. Visceral embodiment and transformative immersion are at the heart of Cosmococa. As Oiticica (as quoted in Ribeiro, 2009, p.149) explained, “[these block-experiments] are directed to the senses, so that through them and through ‘total perception’ individuals are led to a ‘suprasensation’, i.e., an expansion of their ordinary sensorial capacity.” In these rooms we experience affect as a primal condition, described by Gregg and Siegworth (2010) in The Affect Theory Reader as “persistent proof of a body's never less than ongoing immersion in and among the world's obstinacies and rhythms, its refusals as much as its invitations” (p. 1). While we negotiate the world's apparent “obstinacies” in Cosmococa, in Doug Aitken’s Sonic Pavilion, we merge with the world’s vital forces, our “body [is] as much outside itself as in itself—webbed in its relations” (Gregg & Siegworth, 2010, p. 3).

The **Sonic Pavilion** is a circular building, incased by glass walls. Situated on a hilltop, it seems to erupt from the cascading red rocks of the iron-mining terrain. Visitors enter the pavilion by way of a sloping ramp carved into the hill. This passage continues as an ascending spiraling ramp into and around the luminous-but-empty interior. Two holes pierce the center of the room; one hole cuts through the ceiling from which a shaft of light moves with the sun’s rotation. The second hole, cut into the floor, represents the heart of the project. The viewer, however, can only see the hole’s metal rim, inscribed with the artist’s name, the installation title, and the hole’s dimensions. The latter inscription refers to the mile-long shaft bored into the earth’s surface. From here, Aitken lowered recording instruments in order to capture the sounds of the earth’s rotation and shifting seismic plates. The resulting sound is erratic, ranging from a low, steady rumble to abrupt higher-pitched friction. Eight hidden speakers, placed around the room, amplify the sound. As the sound permeates the visitor, the earth’s forces blend with our bodily forces. This transitory blending is transformative. Leaving the pavilion, we return to the landscape more attuned to nature’s cadences above the earth’s surface.

Anthropologist K. Stewart’s concept of “bloom space” captures the dynamic state of in-betweeness that transpires during our traversals through Inhotim’s gardens and Installation art pavilions. Bloom space is where our cognitive understanding of the world is ruptured by arbitrary encounters with the world. As such, bloom space pertains to our multi-sensory, mobilized and open-ended encounters with Installation art. As Stewart (2010) explains, “Everything depends on the dense entanglement of affect, attention, the senses, and matter” (p. 340). As applied to Cildo Meireles’

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46 Freedberg and Gallese also seek to identify “the relationship between embodied empathetic feelings in the observer and the quality of the work in terms of the visible traces of the artist’s creative gestures,” using Jackson Pollock’s drip painting as their sample (p. 199). In a later study, Freedberg and Gallese have focused solely on abstract art to “show the involvement of the cortical motor system in the viewing of static abstract art work.” See M. A. Umilta, C. Berchi, M Sestito, D. Freedberg & V. Gallese. (2012) Abstract art and cortical motor activation: an EEG study. *Frontiers in Human Neuroscience*, 6, 1. In this study they used their own laboratory-based experimental data.

47 Doug Aitken, *Sonic Pavilion*, 2009, pavilion of glass and steel, coated plastic film; tube well 202 m deep, microphones and sound amplification equipment.

48 See for example: Hélio Oiticica and Neville D’Almeida, *Cosmococa 5 Hendrix War*, 1973, projectors, slides, hammock, soundtrack (Jimi Hendrix) and audio equipment, variable dimensions.

49 For Aitken’s use of computer technology see J. Finkel, (2009), *The video artist uses the power of sound—and silence—to define his sculptural environments, Art + Auction*, 33 (2), 48-54.
Através (Through)\textsuperscript{50} and Dan Graham’s Bisected triangle, Interior curve\textsuperscript{51} bloom space makes manifest the ironic affect—or in-betweenness—that permeates our encounters with familiar objects defamiliarized by unexpected relations. The in-betweenness that bloom space and irony occupy constitutes a temporal, transitional period of internal self-reflection and transformation.

Meireles’ Através plays with the labyrinth to induce a transient state of in-betweenness. As Meireles (2000) states, “The journey through a labyrinth is premised on a thoughtful, attentive search. You have to walk, but with each step, you have to stop and think. … [L]abyrinths … help us to slow down” (p. 41). Através comprises an assemblage of screens arranged in a 15-by-15-meter square. The screens are ordinary railings, wooden gates, metal fences, garden lattices, glass, paper and plastic dividers, shower curtains, and beads. Two aquariums filled with translucent fish mirror our own concealment and exposure as other visitors pass through the layers of screens. Broken glass shards cover the floor, creating cracking sounds and slippery surfaces that effect bloom space’s sense of “being abandoned by the world.” Finally, we arrive at the center of the labyrinth, illuminated by an enormous cellophane ball. Our arrival here invites us “to stop and think,” and to re-integrate ourselves, before wending our way out of the labyrinth.

Dan Graham’s Bisected triangle, Interior curve is a construction of mirrored glass and stainless steel. As per the title, the external triangular structure is bisected by a curved interior partition. Here, as in bloom space, “everything depends on the feel of an atmosphere and the angle of arrival.” What first appears as a non-descript glass pavilion is gradually transformed by the viewer’s presence. Here the viewer becomes immersed in a constantly changing interplay of transience and fragmentation, as reflections of landscape and bodies are constantly multiplied, distorted and intermingled. Graham’s glass pavilion activates the individual’s awareness of his multiple identities within the human and natural landscapes. These temporal transformations make manifest the condition of bloom space as “a pacing, a scene of absorption, a dream, … a serial immersion in some little world you never knew was there.”

Cognitive Poetics: Literature and Science

While affect theory and bloom space offer a discursive language that refines the embodied, lived dimensions of experiential aesthetics, its language and methodology remain ephemeral. Cognitive Poetics, a branch of literary theory that analyzes the cognitive processes at work during literary reading,\textsuperscript{52} offers a methodology that bridges humanities and experimental science. Most important for my project, Cognitive Poetics treats rupture and defamiliarization as modalities unique to literary as opposed to non-literary reading, modalities that also distinguish Installation art from the ordinary world. For Cognitive Poetics, rupture and defamiliarization result from “some drastic interference with . . . the regular course of cognitive processes, and the exploitation of its effects for aesthetic purposes” (Tsur, n.d., Interview, para. 4).

Literary theorists R. Tsur, D. Miall, and P. M. Davis represent varying degrees to which Cognitive Poetics has collaborated with neuroscience. I have extracted from their studies cognitive and neurological data that apply to experiential neuroaesthetics as manifested in Installation art at Inhotim. Tsur’s (1992) work on the grotesque exemplifies how he uses cognitive psychology to “systematically account for the relationship between the literary devices and their perceived effects” in “information processing” (p. 1). The grotesque, in particular, is a useful model for the cognitive experience of defamiliarization in Ernesto Neto’s Nave Deusa (Vessel Goddess).\textsuperscript{53} As Tsur (2012) explains, the reader “perceives the image as grotesque, [as] something that is simultaneously laughable and horrifying or disgusting. … The grotesque [deploys] poetic devices that produce an emotional disorientation which is experienced as a shock, perplexity [or] surprise” (p. 253).

For Nave Deusa, Neto combined Lycra tulle, clove spice, and Styrofoam to mimic the body’s skin, flesh, and orifices. Evoking the in-betweenness of bloom space, Neto states, “Skin permeability was so clear through [this work]… colored powders were coming out of the pores of the pieces, like sweat” (as quoted in Denegri, 2008, p. 21). Neto conceived Nave Deusa as a metaphor for the human body as container of biological and social interconnectivity. Yet, the flesh-like shapes appear bizarre, obscene, and, even, grotesque. The holes and slits evoke mouths and vaginas. The rounded anchors simulate testicles. Confronted by our visceral other, we are both attracted and repelled, an emotional disorientation intensified by the sweet/sweat scent of clove.

To analyze “emotional disorientation” that the grotesque induces, Tsur (2012) developed the principle of “rapid and delayed categorization” (pp. 243-49), derived from neurological models of information processing. Tsur aligns the cognitive processing of the grotesque (and the unfamiliar in general) with the right cerebral hemisphere, where delayed categorization occurs in a diffuse state, as with affects and emotions. Conversely, rapid categorization occurs in the left hemisphere where sequential processing forms logical information. Delayed categorization is prolonged because it engages the memory system, sensory loading, and extensive mental processing space. As Tsur (2012) states, such a delay, “involve[s] a period of uncertainty that may be quite unpleasant or even intolerable” (p. 2). When applied to our “emotionally disorienting” experience of Installation art, the principle of delayed categorization facilitates a mapping of the brain’s increased activity in the right hemisphere that registers diffuse input.

\textsuperscript{50} Cildo Meireles, Através, varied materials, 600 x 1500 x 1500 cm, 1983 -1989.
\textsuperscript{51} Dan Graham, Bisected triangle, Interior curve, 2002 , mirrored glass and stainless steel, 220 x 713 x 504 cm
\textsuperscript{52} See D.S. Miall (2007).
\textsuperscript{53} Ernesto Neto, Nave Deusa, 1998, Lycra tulle, sand, clove and styrofoam, 500 x 950 x 690 cm.
Miall has merged Cognitive Poetics with neuropsychology in collaboration with psychologist D. Kuiken. In 1994 Miall and Kuiken measured the duration of delayed categorization in real time, using “foregrounding” as the literary device for tracking the “defamiliarization” process. (Miall, 2009, p. 238) Foregrounding refers to making something stand out from the surrounding words or images. Its defamiliarizing function occurs in two related ways: as unexpected regularity, and as unexpected irregularity. Miall and Kuiken found that foregrounding inhabits a complex cognitive process, beginning with pre-cognitive responses to its “unfamiliarity” (p. 240).

Olafur Eliasson’s *Viewing Machine* replicates the pre-cognitive processing of foregrounding’s defamiliarization. Eliasson adapted the kaleidoscope’s “unexpected irregularity,” replacing colored glass with the surrounding forest and mountain range. Here the technological mechanism, rotated by the viewer, foregrounds nature’s vistas while its angled mirrors reflect and fragment those views. The work’s title is equally disruptive, since the *Viewing machine* deconstructs our vision, rather than facilitates an orderly cognitive process. This ironic play on expectations makes the impact of unsuspected fragmentation both extraordinary and shocking. Eliasson’s device actualizes the Cognitive Poetics model, prolonging the cognitive reintegration that follows defamiliarization and, in the artist’s words, “throw[s] the world a new” (Eliasson & Birnbaum, 2010, p. 18).

Miall and Kuiken also used psychological methods to identify the “self-modifying” effects of defamiliarization (Miall, 2007) which accommodate the transformative aspect of Installation art. Based on these experiments, they have redefined delayed categorization as the “defamiliarization-reconceptualization process,” wherein the two poles are mediated by feeling (Miall, 2009, p. 235). Because Miall and Kuiken have broadened the affective spectrum of the defamiliarization process, their research offers a model for making bloom space and delayed categorization concrete and measurable exponents of experiential neuroaesthetics.

Davis’s research focuses directly on brain anatomy. Davis has joined with linguists, psychologists, and neuroscientists to capture the various brain regions activated by reading Shakespeare’s texts that deploy the functional shift. The functional shift is another form of rupture and defamiliarization. This rhetorical device changes “the grammatical status of words, e.g., using nouns as verbs” or verbs as nouns (Keidel, Davis, Gonzalez-Diaz, Martin, & Thierry, 2013, p. 913). Davis’s team finds that the functional shift “triggers a surprise effect inviting mental re-evaluation, seemingly independent of semantic processing.” (Keidel et al., 2013, p. 913). This research is most useful for re-modeling experiential aesthetics into experiential neuroaesthetics. First, it demonstrates how an aesthetic of rupture can become the subject of neuroscientific research.

Second, the team’s neurological findings might also apply to the transformative affects triggered by the defamiliarization of objects within Installation art.

Since 2008, Davis’s team has used three technologies to measure brain activity and the effects of the functional shift. As Davis (2008) explains, the team used: EEG to locate that functional shift’s “unique effect on the brain;” MEG to record “rapid, ‘peak’ activity during the comprehension of functional shift;” and fMRI to pinpoint “brain-activation by location” (para. 7). Their results showed that functional shift processing increased activity in both the left and right hemispheres. Most important, they found that this activity was much more widely dispersed throughout the brain’s anatomy, “in regions not typically activated in everyday language processing” (Keidel et al., 2013, p. 914).

**Prospects for Experiential Neuroaesthetics**

As Davis’s team acknowledges, these very same findings can be extended to other forms of verbal/linguistic defamiliarization, such as irony and humor. The difference in medium notwithstanding, I also hypothesize that some of these areas may also be activated during our encounters with Installation art, especially those that are not typically activated in everyday language or information processing. As we have seen, Installation art deploys visual and experiential analogues of irony and humor. These experiential affects are all the more heightened in Installation art by our tactile and sensory mechanisms dispersed through our body anatomy.

While Cognitive Poetry offers a viable model for mapping the brain’s processing of rupture, its focus on the cognitive process is limiting for Installation art’s broader spectrum of physiological, sensory, and affective responses. In the remainder of this paper, I review recent neuropsychological research that focuses on a wider range of aesthetic responses, including negative valence and the sensorial and temporal dynamics of aesthetic processing. These studies validate Cognitive Poetics’ theoretical and experimental findings. They also support modelling of a global neuronal workspace engaged in aesthetic processing. As suggested by Davis’s team’s experiment on the functional shift, such a model is especially well suited for substantiating experiential neuroaesthetics exemplified in Installation art.

**The Question of Negative Valence**

In this section I use negative valence to refer to responses to art works considered “not beautiful” and which cause

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57 Davis’s project is exemplary for transitioning from humanities-based theory to scientific inquiry. For an overview of his project, at various stages, see Davis, (n.d.), The shakespeared brain, *Literary Review* [http://www.literaryreview.co.uk/davis_07_08.html](http://www.literaryreview.co.uk/davis_07_08.html); and Davis, in collaboration with N. Roberts, V. Gonzalez-Diaz, & G. Thierry, (2008), The shakespeared brain, *The Reader*, 23, pp. 39-43; rpt: [http://moreintelligentlife.com/story/the-shakespeared-brain](http://moreintelligentlife.com/story/the-shakespeared-brain)

58 This research is based on self-report data and surveys (quantitative psychological research), neuro-imaging and other physiological methods for tracking brain activity.
rapture, confusion, surprise, and anger. Until recently, there has been a paucity of research on negative valence. Initially, landmark studies issued from psychological research that expanded the appraisal model of aesthetic emotions to include negative responses to art. Psychologists M. Nadal and S. Brown and their respective research teams have extended these psychological studies to neuroimaging and other physiological methods to monitor brain activity during aesthetic processing of both beautiful and not-beautiful art.

In tracking the onset, progression, and complex processing of aesthetic engagement, Nadal’s team “used MEG [and TF trackings] to register brain activity while participants decided about the beauty of visual stimuli” during an aesthetic appreciation task. They found that “the duration of processes specifically involved in rating stimuli as beautiful” lasted more than twice as long as activity specifically related with stimuli rated as not beautiful (Munar et al., 2012b, p. 5). In addition to this finding, the results indicated that these differences occur in all four frequency bands associated with different neural functions, with the greatest frequency and coordination occurring for beautiful stimuli (Munar et al., 2012a, p. 9). Nadal’s team interpreted these results in terms of the Global Neuronal Workspace framework, hypothesizing a neuronal workspace for aesthetic appreciation. Within this space, “neural activity occurs at various spatial and temporal levels which must be dynamically adjusted,” a process which takes place via the “synchronization of neural oscillatory activity” (Munar et al., 2012a, p. 9).

My question remains, however: what does this mean for neural activity processing of stimuli deemed not beautiful? We find partial answers in Nadal’s team’s second study. Using their previous data from MEG and TF trackings, they identified the initial negative aesthetic impression formation in the right lateral orbitofrontal cortex, “underlying the representation of the non beautiful stimuli’s negative reward value” (Munar et al., 2012b, p. 5). These results validate Tsur’s hypothesis that the cognitive processing of the literary grotesque occurs in the right cerebral hemisphere, where delayed categorization unfolds. Based on this concordance, can we identify the IOFC as a site that would be activated by the initial onset of aesthetic rupture in Installation art; and if so, at what point in the assessment process? Could the negative processing be reversed, as shown in Miall and Kuiken’s foregrounding experiment, once the viewer acclimates to and seeks to resolve the rupture?

Nadal’s team’s broader conclusions justify the need for neural research on negative aesthetic responses as a stand-alone modality and as a primordial attribute of Installation art and experiential neuroaesthetics. As they concluded, this shorter duration of negative stimuli “does not mean that these stimuli were not processed any further. It means that subsequent processing was not particular to non beautiful stimuli” (Munar et al., 2012b, pp. 5–6). For my purposes, these findings raise additional questions. While the initial formation of negative valence occurs in the IOFC, where does that extended processing of negative valence take place? Recall, for example, whether you would feel pleasure or discomfort from walking on glass shards; or whether you would feel pleasure, anger, or disgust from erotic/aromatic art forms. Can we isolate different neurotransmitters and pathways to different brain regions activated by negative valence? Brown’s team’s study provides some answers.

Brown et al. (2011) argues for “ground[ing] aesthetic emotions in [psychological] theories of emotion more generally” (p. 251). In their study, researchers presented a “comprehensive analysis … of neuroaesthetic processing by reporting the results of voxel-based meta-analyses of 93 neuroimaging studies of positive-valence aesthetic appraisal across four sensory modalities” (p. 250). Based on these findings, they identified which brain region registers valence, in general, and which sub-regions register positive-or-negative valence. Their results generally concur with Nadal’s team regarding a predominance of neural activity for positive valence in the lateral orbital frontal cortex. Brown et al. (2011) also hypothesize an aesthetic neural workspace, but with a difference. In identifying brain regions active during aesthetic appraisal they found that the OFC and anterior insula “are reciprocally connected with one another and show parallel functions when it comes to reward and emotion” (p. 255). They arrived at “an overall picture of [positive] aesthetic processing emerged of sensory-specific regions of the OFC being co-activated with a supramodal area located in the anterior insula” (p. 253).

What is particularly compelling for an aesthetic of rupture as inscribed in Installation art is Brown et al.’s (2011) evidence that both the OFC and anterior insula are bivalent; each region can process both negative and positive valence. The team also identified each region’s different functions for processing these valences: “the OFC is seen as an extension of ‘what sensory pathways that process object-recognition information, whereas the anterior insula contains a meta-representation of bodily responses from inputs coming from the interoceptive cortex in the posterior insula” (p. 256). Although their findings are based on experiments that

59 See Brown et al., p. 251.
61 While both Nadal and Brown and their respective teams study negative aesthetic appraisal, it is only in relation to positive aesthetic appraisal, resulting in a bias toward brain activity related to aesthetic appreciation and reward.
measured outcomes for localizing positive valence, Brown et al.’s (2011) detailed analysis of these bivalent brain regions, and their concordant processing, provide the most viable models for mapping the dynamics of an aesthetic of rupture and, more broadly, an experiential neuroaesthetic.

To this end, I would first identify the anterior insula’s functions as those most closely related to the self-reflection that occurs during our temporal-spatial engagement with an Installation art work. According to Brown et al. (2011), “The most strongly activated region corresponds with the anterior insula proper, a paralimbic region associated with interoceptive awareness/insight (…), a sense of the “feeling self” (…), core affect (…), the subjective experience of emotions such as pain, sadness, anxiety and disgust (…), and the capacity to predictively anticipate the impact of emotional events on the body's responses” (p. 254). More specifically, Brown et al. (2011) identify the right anterior insula as the most activated sub-region for positive-valence aesthetic appeal: “the right anterior insula contains a meta-representation of the body that is associated with the subjective awareness of the ‘feeling self’” (p. 254). Does the right anterior insula’s primacy in positive aesthetic processing, also speak of its opposite? If our sense of self is ruptured by Installation art would this region also be responsible for anxiety, sadness, etc. and for a later reconciliation between our initial rupture and a sense of self renewal at the end of the aesthetic experience? Further research into the anterior insula’s bivalence may provide answers. Likewise, both the discreet objects and the ensemble of Installation art, pose questions related to the OFC processing of external sensory stimuli affecting the nervous system. Brown et al.’s (2011) conclusions point to this direction (p. 255).

Conclusion

For my project, Brown et al.’s (2011) analysis of the insula’s complex visceral (biological) functions and their distinction between the concordant functions of the OFC and anterior insula, together with the global neuronal networks proposed by Brown’s and Nadal’s teams, offers the empirical and theoretical foundation for identifying brain regions activated during Installation art experience. I propose that these complex areas and dynamic neural interactions mirror the complex, dynamic psychological and physical states that we experience during transitory, transformative encounters with Installation art. While future experimental research might build on the neurological studies reviewed here, such a research program will also be called upon to address the physiological changes that Installation art forces upon its participants. Finally, an experiential neuroaesthetic will attend to both neural coordination and discord as equally important markers of brains at play.

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References


FlexTiles: A Software for Studying Geometrical Pattern Production and Preference

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Abstract
Abstract visual patterns are ideal candidates for studying creative process empirically. The processes by which pleasing visual structures such as geometrical patterns are produced remain poorly understood. We present data on the production of visual geometric patterns that we gathered using FlexTiles, a software package that allows the empirical study of both the creation and appreciation of visual patterns under controlled laboratory conditions or in web-based research.

Keywords: geometrical patterns; Gustav Fechner; method of production; symmetry

Introduction
Aesthetic preferences have been the subject of philosophical debate and empirical research for many years. We argue that in order to fully understand the human aesthetic drive, it is necessary not only to study aesthetic preferences but also to examine the creative processes by which artworks, ornament, decoration, and so on are produced. Our approach follows Gustav Fechner's suggestion to employ at least two of three methods (Wahl "Preference", Herstellung "Production", and Verwendung "Use") in empirical aesthetics [Fechner, 1876]. We also follow Fechner's credo of studying aesthetics from below, in that we use simple non-representational geometrical patterns and recruit participants with no particular training or art background.

As Ernst Gombrich pointed out in his book "The Sense of Order" [Gombrich, 1984], the human drive to produce regular, symmetrical objects and patterns is not only a ubiquitous phenomenon, but also offers a rich field for empirical research. Our main research focus in empirical aesthetics lies on the study of geometrical patterns possessing various types of symmetry.

Abstract geometrical patterns are extremely common around the world and archaeological records suggest that they are at least as old as representational art [Texier et al., 2010, Henshilwood et al., 2002]. Studying why and how humans use complex geometric patterns so pervasively potentially holds a key to understanding basic properties not only of the human mind, but also the roots of human culture. Because geometric patterns are so widespread in humans, our findings can potentially shed light on a fundamental aspect of creativity and aesthetics shared across many, if not all, human cultures.

Analyzing creativity with participants in laboratory settings is an extremely challenging problem. As a result, to date, empirical aesthetics has generally focused on the perceptual mechanisms underlying the aesthetic appreciation process rather than on how such pleasing objects are produced (for notable exceptions see for example [McManus, 1980, McManus et al., 2011]). While the focus on perception has been extremely fruitful, we maintain that to empirically study aesthetics from the perceptual side is to see only one side of the aesthetic coin. In order to develop a fuller picture of aesthetic sensitivities underlying artwork, we also need to understand the processes by which aesthetic output is created, and ultimately, how these processes interact with perceptual mechanisms.

The difficulty in analyzing creative output such as drawings and paintings derives from at least two problems:

1. The quantification of semantic content in representational artwork is extremely difficult. While of course not all artwork is representational, images very often convey semantic information by depicting objects, people, and so on. Quantifying the semantic dimension of an artwork thus depends on contextual knowledge, which in turn depends on an individual's background, which is, of course, extremely variable within and across cultures. This problem was already addressed by Fechner [1876], who pointed out that the composition of a representational image may be determined by the depicted objects and the artists, while non-representational images and ornament rely more strongly on formal perceptual organizing principles such as symmetry and repetition and less on semantic and conceptual organizing forces.

2. The computational challenges of quantifying structure in even the simplest line drawings are immense: a two-dimensional space in which structures can be drawn or painted in an unconstrained fashion allows an essentially unlimited number of unique outputs that may differ virtually without bound in multiple dimensions such as number of elements, color, orientation, stroke quality, style, and so on. Thus, to meaningfully compare output produced by different individuals using objective measures (rather than, or in addition to, subjective measures such as ratings) is extremely difficult.

In contrast, geometrical patterns are well suited to studying creativity because their formal characteristics can be easily analyzed (e.g., degrees of symmetry, entropy, etc.), and yet
they are varied enough to allow innovation and creativity during the production process.

For these reasons, we argue that geometrical patterns are manifestations of the human aesthetic sense that are ideally suited for investigation in empirical studies including both the productive and perceptual processes underlying aesthetics.

**FlexTiles**

In order to study the production of geometric patterns, we developed FlexTiles, a software package using the Python programming language (python.org) that allows us to present interactive patterns on a regular grid to participants who can change the orientation of the individual elements ('tiles') in the grid (see Fig. 1) by clicking on them. The tiles we use are modeled on attractive real-life tiles that are commonly employed in Spain, Portugal, and other countries.

To date, we have used FlexTiles in experiments that allow participants to both create visual patterns of their own as well as indicate their preferences for different pattern variants. Research on human visual processing suggests that global structures are preferentially processed over local features (global precedence effect [Navon, 1977]) in normal adults. In contrast, manual production of paintings, sculptures, embroidery and so forth, often requires a more local focus, which may interact in interesting ways with global perception. Recent studies suggest that individuals with drawing talent show less global interference and enhanced local perceptual processing [Chamberlain et al., 2013]. Thus, we have implemented a local process production task as well as a preference tasks in which participants can apply their usual (global) viewing patterns, with the goal of comparing structural properties of creative output and preferences.

**Creativity Tasks** In creativity tasks, participants are presented with square grids containing a matrix of tiles in random orientations. They have no specific task other than to change as much or as little in the array as they want. Our participants readily engage in the creativity task, despite the fact that they generally do not have any artistic background. Instructions are kept to a minimum, and we do not include words such as "beauty", "pretty", or "pleasing" unless the experimental design specifically calls for such distinctions (see "Outlook").

**Preference Tasks** We have implemented two types of methods to gather preference data: (i) Likert scales, (ii) two-alternative forced choice comparisons.

**Production and preference compared** We found that the types of global patterns that participants produced depended on the local tile properties [Westphal-Fitch et al., 2012, Westphal-Fitch et al., 2013]. Simple translational patterns were more likely to be created with tiles that had orthogonal symmetry (i.e. either along the central horizontal or vertical axis, depending on tile orientation), while more complex grouped patterns were significantly more likely to be produced with tiles that contained diagonal symmetry. This difference suggests that there is a strong connection between local tile properties and global pattern properties during production (see Table 1).

Table 1: The pattern types produced with the three different tile types experiment described in detail in [Westphal-Fitch et al., 2013].

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Diagonal (n)</th>
<th>Orthogonal (n)</th>
<th>Non symmetrical (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grouped</td>
<td>80.8% (21)</td>
<td>0</td>
<td>19% (5)</td>
</tr>
<tr>
<td>Translational</td>
<td>9.38% (3)</td>
<td>50% (16)</td>
<td>40.6% (13)</td>
</tr>
</tbody>
</table>

We then compared the patterns that participants produced with those that they preferred. In production trials, participants saw a matrix of tiles that had a random orientation and were informed that they could change as much or as little in the matrix as they liked. In preference trials, two patterns were presented side by side and participants indicated their preference for one of the two images by clicking on the preferred one. We compared three overall organizational patterns: translational symmetry, grouped symmetry, and random orientations (for examples see Figure 2). In general, any kind of order was strongly preferred over random structures. However, not all patterns were equally preferred. For diagonal tiles, we found a strong preference for the grouped pattern, mirroring the production data (see Figure 3 for a comparison of production and preference data).

In contrast, for horizontal tiles we found no correlation between tile type and global patterns. Participants had no clear preference for translational patterns made with orthogonal tiles over the same pattern composed of diagonal tiles. This contrasts strongly with the production data, where horizontal tiles were never arranged into grouped patterns.

![Figure 3: In production trials (left), there was a strong tendency to make grouped patterns with diagonal tiles and translational patterns with orthogonal tiles. The same tendency was found in preference tasks (right) for the grouped/diagonal combination, but not for the translational/orthogonal combination.](image)
Discussion
The data presented here suggests that we cannot simply assume that preference tasks fully capture the extent to which elements in aesthetic outputs interact. In our experiments, a specific connection between orthogonal tiles and transversal patterns only became apparent during production trials. One reason for this disparity may be that the production task is (by design) strictly local, in that participants can only change one element at a time, while the perceptual task is unconstrained and participants can readily apply global viewing patterns. To test this interaction further, the perceptual processes could be constrained by a moving window (easily implemented using eye tracking technology) that would only reveal one tile at a time to the observer. If local sensitivities are heightened with such a procedure, we would expect preferences under these conditions to mirror the production biases we observed for horizontal tiles.

In future work, we plan to introduce a social dimension to pattern production and preference. The fact that embellishing everyday objects with visual patterns does not contribute to an object's function in an immediate way has led some researchers to suggest that the ability to produce and process complex cultural artifacts may be correlated with the emergence of social complexity [Miller, 2001] and group size [Derex et al., 2013]. We are currently conducting studies to test to whether the time and effort that participants invest during the creativity trials depends on the implied social context. To this end, we either ask participants to create patterns that they personally find pleasing, or ask them to create patterns that will be rated highly by others. Preliminary analysis suggests that a social context has no effect on the effort that participants invest during pattern production. Further steps may include production of patterns as a “team effort” in groups of varying sizes, to test whether the positive effect of group size that Derex et al [2013] found on the complexity of cultural processes translates in a similar fashion to the complexity of geometric patterns.

Furthermore, we are currently conducting a cross-cultural study on pattern production and preferences in Western and Asian cultures on the Internet, using an online version of FlexTiles (to be found on www.somacca.net – please participate!). With this approach, we intend to explore to what extent data generated under relatively relaxed, natural settings is comparable to output produced under controlled laboratory conditions, and in the broader picture, to what extent the preferences for structures in visual patterns are shared across cultures.

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References
Figure 1: During creativity trials, participants are presented with an initially random array and can change the orientation of the square tiles by clicking on them with the mouse. The trial ends when participants click on the "Finish" button, upon which the final state of the tile array is recorded.
Figure 2: The rows show the two tile types (diagonal symmetry and orthogonal symmetry; symmetry axes indicated in blue) ordered according to a translational pattern, a grouped pattern, and arranged randomly.
Can Infants Express Sensitivity to Musical Aesthetics Similarly to Adults? Insights from Beatles and Beethoven

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Abstract
Little is known about the development of enjoying aesthetics and the ability to perceive it in music. The aim of the study was to examine human neonates, their mothers and adults' sensitivity to musical aesthetic patterns. We hypothesized that participant's sensitivity to musical aesthetic patterns will be expressed through distinct behavioral responses as a function of aesthetic features, maturation and exposure to musical genres. All participants were sensitive to differences between aesthetic and non-aesthetic patterns in music, with heightened sensitivity to aesthetic patterns as a function of musical genre. Cultural exposure, even at infancy, elicited a stronger response to aesthetic patterns within the classical genre. This study deepens our understanding of how we perceive aesthetics in the world around us.

Keywords: Aesthetics; Infancy; Musical Structures; Development; Musical Exposure

Introduction
The term aesthetic was first used at 1735 in the context of emotions and feeling which are evoked as responses to art, by the German philosopher Baumgarten in his book: ‘reflections on poetry’ (Baumgarten, 1735; Shiner, 2001). People seem to recognize and distinguish between aesthetic and non-aesthetic patterns in the world that surrounds them. For example, researchers have found that visual pieces of art that are considered ‘beautiful’ evoke a different neurological response than ones considered ‘ugly’ (Kawabata & Zeki, 2004). The preference to perceive aesthetic experiences has been well documented throughout history (Maslow, 2013). The past decade of neuroscience research has yielded evidence that the human mind is attuned to discover aesthetic patterns; in fact, this sensitivity can be traced to specific neurological activity that occurs when humans view aesthetic art (Ramachandran & Hirstein, 1999).

It has been suggested that aesthetic structures facilitate the ability to predict what is coming next with a higher probability of success relative to non-aesthetic patterns (Young, 1987). This ability may have developed due to the fact that it is crucial to our everyday life to be able to predict future events with a high probability of success (Tillmann & Lebrun-Guillaud, 2006).

It is well known that listening to music elicits expectations that find their roots in aesthetic principles and melodic structure (Loui & Wessel, 2007). The listener’s mind therefore can develop an expectation of how a specific melody will to proceed (Meyer, 2008), however, it is not clear when does it emerge and what factors influence it.

Research on the developmental process that leads to sense of pleasure from aesthetic music, shows that sensitivity to a music element appears early, and is evident already in neonates (Carral et al., 2005; Hannon, Soley, & Levine, 2011; Kushnerenko et al., 2007; Perani et al., 2010; Trehub, 2001; Trehub, 2003). Length of gaze may be used as a proxy for preference. For example, a study showed that infants looked longer while listening to consonant, defined as aesthetic (Schellenberg & Trainor, 1996), as compared to dissonant intervals (Trainor, 2012; Trainor & Heinmiller, 1998). This suggested that consonance is a more basic premise of the auditory system (Fishman et al., 2001; Trainor, et al., 1998), at least at a micro-level of analysis.

Previous research has thus far focused on minor music intervals; however, exploration of infant's ability to perceive an aesthetic sensation in larger scale musical structures is markedly under-studied. It is plausible that a comparable process that occurs on a minor scale, may be evident in larger musical structures as well, such that infant will respond differently to an aesthetic musical structure as compared with non-aesthetic ones.

Given newborns’ sensitivity to music in the early days of life, we found it interesting to explore their ability to perceive aesthetic musical structures, as compared with that of adults, who are exposed to stimuli over the course of their lifetime. In some aspects, neonates seem to exhibit similar capabilities as adults in regard to perceiving music (Trehub, 2001). Like an adult, the newborn’s brain is able to recognize invariant elements from a variant acoustic environment (Carral, et al., 2005). Further, as the auditory system develops, it can perceive and process larger and more complex musical structures (Trainor, Tsang, & Cheung, 2002). This may suggest that perceptual sensitivity to aesthetics in music increases with age, such that the ability to detect subtle changes in music structures improves with increased exposure, and specific brain maturational process occur in response to that exposure (Hannon & Trainor, 2007). Additionally, research indicates that exposing neonates to auditory elements after birth is critical to the development of their auditory abilities (Standley, 2001). Thus, it may be that infants show the same trends towards aesthetic music
structures as adults, and these patterns become more sensitive with development and exposure. Therefore, we hypothesized that participants will respond to musical patterns as a function of aesthetic features, maturation and exposure to musical type.

**Methods**

**Participants**

The experiment consisted of three groups: a group of adults (N=30; mean age=27.8±4.8 years; 63% female). A group of young infants (N=17; mean age=4.0±1.51months; 70% female), and a group of their caregivers (N=17; mean age=29.7±3.2 years; 15 mothers; 1 female experimenter; 1 father). Participants in the adult and caregiver groups did not differ on education levels.

**Stimuli**

In the current experiment we chose to present two pieces, based on an extensive pilot search, and rater's judgments that selected the most preferred musical pieces in each category – modern: Beatles - 'Let it be' and classic: Beethoven - 'moonlight'.

The experiment included four versions of Beatles and four versions of Beethoven music clips: an aesthetic condition, made up of the preserved musical structure, included the original “question” immediately followed by the original “solution”, and three non-aesthetic music conditions: A recursion condition, in which the question segment was played twice consecutively without inclusion of the solution phrase; A transposition condition, in which the solution segment was played first, immediately followed by the question segment; and a random condition, in which portions of the clip were divided and re-arranged in a random order to control for enjoyment of hearing the individual components, independent of the aesthetics of the musical structure (Figure 1).

![Figure 1: 'Let it Be' music structure.](image)

Legend. The Original Condition (Preserved aesthetic structure). green= coda question section, purple-blue= transition section, orange-red= answer.

**Procedure**

Prior to participation, caregivers and adults signed informed consent and filled out demographic and exposure to music questionnaires. Experimental design consisted of two identical experiments that were presented to the infants and their caregiver and to the adult group. Each infant was seated on his parent’s lap and the adult sat in a chair while facing a computer monitor. A black and white checker board was presented on the screen to attract the participant's gaze while various aesthetic and non-aesthetic musical clips played (Figure 2). Between each clip, there was a three-and-a-half second break. The participants signaled to continue when ready. If the infant was not comfortable for any reason a break was taken to tend to the child’s needs.

![Figure 2: Infant-mother experimental setup.](image)

**Data collection and Processing**

Participants' behavioral responses were recorded using an external camera that was placed above the monitor in order to record the participants' faces. The video clips were later micro-coded for the behavioral, vocal and activity patterns. Dependent measures included: inactivity, non-vocalization, concentration, and gaze duration directed towards the screen (the latter measures applied only for the adult and infant group – since mothers were instructed to keep their eyes closed to minimize affecting their infants' responses).

For analysis purposes, the six music clips (i.e., two aesthetic and four non-aesthetic ones) were divided into five segments: question, transition, solution and end. All segments ranged from three to seven seconds in length. The two other non-aesthetic random clips were divided into eight equal segments, each lasting three-and-a-half seconds. Every segment was coded for frequency and duration of behavioral variables. Average frequencies and durations were then calculated for each clip and an average of all non-aesthetic clips was calculated.

**Results**

Repeated measures analyses were performed measuring duration and frequencies of behavioral expressions as a function of aesthetics for both music genres. All groups showed more concentration expressions during the aesthetic Beatles condition as compared to the aesthetic Beethoven condition. Such differences were not evident in non-aesthetic conditions. Specifically, all groups were more frequently inactive (P<.000); adults and infants showed higher frequencies of gazing toward the screen and were concentration (p<.002; p<.04; respectively, Figure 3); and both caregivers and infants displayed longer durations and
higher frequencies of non-vocalization in the aesthetic Beatles condition as compared with the aesthetic Beethoven condition (p<.000; p<.000; respectively). None of these differences were noted for the non-aesthetic patterns.

Thus, our results point to a consistent pattern of responses underscoring heightened sensitivity while listening to aesthetic patterns as compared with non-aesthetic patterns among all three groups. This suggests that the tendency to perceive musical aesthetic patterns exists independent of age.

Figure 3: Aesthetics effects on concentration expressions in infants and adults in modern and classical music.

**Age Effect**

To further test the age hypothesis, repeated measures analyses were conducted comparing concentration expressions based on aesthetics, genre, and age (i.e., adults vs. infants and caregivers vs. infants). The analysis showed interaction effects indicating that adults directed more gazes towards the screen as well as longer durations of concentration in the Beatles aesthetic condition versus the Beethoven aesthetic condition as compared to infants (p<.015; p<.05; respectively). In addition, the same pattern of interaction indicated less vocalization in the Beatles aesthetic condition versus the Beethoven aesthetic condition within the caregiver group as compared to infants (p<.015; Figure 4). These differences were seen only in the aesthetic conditions and were not seen within the non-aesthetic conditions.

Figure 4: Aesthetics effects on vocal expressions within infants and mothers in modern and classical music.

These results also indicate that though adults, caregivers and infants seem to show the same tendency of responses to aesthetic patterns, the effect is stronger as age increases.

**Development of Specific Aesthetic Expressions**

In order to study if there are differences in aesthetic preferences within different age groups as a function of music genres, T-tests were used (Figure 5).

Results of the three groups showed increased effect for the Beatles aesthetic as compared with the Beatles non-aesthetic conditions. Specifically, adults directed their gaze more frequently and for longer durations (p<.000; p<.000; respectively), and were more frequently concentrated (p<.000) during the aesthetic condition as compared to the non-aesthetic ones. Similarly, the caregiver group were non-vocal for longer durations and more frequently during the aesthetic Beatles as compared to the non-aesthetic condition (p<.000; p<.004; respectively). Moreover, the infant group also showed the same trend of more frequent and longer durations of non-vocalizations (p<.02; p<.002 respectively) as well as more frequent inactivity (p<.007) in the Beatles aesthetic as compared with the non-aesthetic condition.

In the Beethoven conditions, an opposite pattern was seen in the three groups, such that adults directed their gaze for shorter durations and less frequently (p<.000; p<.000; respectively), were concentrated for a shorter durations and less frequently (p<.037; p<.002; respectively), and were inactive less frequently (p<.01) during the aesthetic as compared to the non-aesthetic condition. Caregivers were non-vocal more frequently (p<.01), and were less frequently inactive (p<.01) during the Beethoven aesthetic as compared to the non-aesthetic condition. Infants showed similar nearly significant trends as compared to their caregivers and adults.
This indicates a genre specific aesthetic sensitivity among all three groups; however in the Beethoven condition infants seem to show this pattern to a lesser degree potentially indicating the importance of exposure.

**Effect of Musical Exposure on Infants and Adults**

Given the above findings that infants tend to be sensitive to aesthetics in music, but less so than adults, it is important to explore the notion that exposure to music may influence this difference. For this reason we examined the effect of exposure to classical music (i.e., reported exposure vs. no exposure) for both infants and adults.

Results showed that exposure to classical music affects infants in the Beethoven non-aesthetic condition, such that those whose parents reported higher levels of exposure showed less frequency of concentration (p<.001), more frequent inactivity (p<.001) and less frequent gazes toward the screen in non-aesthetic conditions (p<.01) as compared to infants who were less exposed to classical music (Figure 6). No effects were seen within the aesthetic condition.

**Discussion**

The purpose of this study was to examine the sensitivity of human neonates, their mothers and adults to aesthetics in musical structures which have a preserved musical question and answer. We chose to rely on behavioral measures, such as concentration expressions, rather than on verbal reports, as reactivity to aesthetics may not necessarily be a conscious experience (particularly for very young participants).

Using a carefully controlled empirical design, a novel pattern shared by adults and neonates was identified. A pattern that is indicative of sensitivity to aesthetics in music structures in classical and modern music. As was hypothesized, participants showed different response patterns to aesthetic and non-aesthetic musical structures within the two musical genres. This preliminary finding - which shows that infants, like adults, discriminate between aesthetic and non-aesthetic patterns in the auditory domain - is consistent with prior studies dealing with the visual field. These latter reports examined infant preference to aesthetic versus non-aesthetic faces (defined by adult perception of attractiveness), found that infants look longer towards attractive rather than less attractive faces (Samuels, Butterworth, Roberts, Graupner, & Hole, 1994; Samuels & Ewy, 1985). Current findings extend these results to the musical domain: It has been suggested that longer periods of viewing visual art correspond with a preference for that stimuli (Vartanian & Goel, 2004) in a manner that fits with the assumption that the human mind is attuned to aesthetic patterns (Ramachandran, et al., 1999). Thus, we assumed that longer gazes, along with a more concentrated state while listening to aesthetic musical structures, revealed that people are more closely attuned to understanding subtle differences in aesthetic patterns as compared to non-aesthetic ones.

It is interesting to explore why are we attracted to aesthetic patterns at a biological level. One theory suggests an evolutionary explanation, such that aesthetic patterns were once associated with a higher sustainable survival value (Tooby & Cosmides, 2001), and that the neural network evolved over time to prefer aesthetic stimuli. Under this field of research, additional studies hypothesize that brain adaptation resulted in experiencing aesthetics as pleasurable (Hekkert & Leder, 2008; Johnston, 2003). Although preference for these aesthetic structures is no longer linked to survival, people still maintain the predilection (Tooby, et al., 2001). Our study furthers this evolutionary framework, as it revealed that sensitivity to aesthetics is evident already in infants, and proceeds throughout the more mature age groups.

Both age and exposure seem to moderate this initial preference for aesthetics in music. We found that the different responses between both modern and classical aesthetic conditions were reflected the most in the adult and caregiver groups, such that they showed more concentrated expressions during the modern aesthetic condition as compared with the classical aesthetic condition. This pattern was also seen among very young infants; however the effect was stronger among the older groups. This suggests that the

![Figure 5: Aesthetics effects on concentration expressions within adults in modern and classical music.](image)

![Figure 6: Exposure effect on concentration expressions to aesthetics within classic music among infant.](image)
ability to discriminate between and to notice subtle variations in aesthetic musical patterns evolves early on in development, but continues to develop with age, maturation, and importantly, with exposure to musical patterns in cultural contexts.

Parson's framework may shed light on the processes that underlie these findings. This framework classifies responses and preferences to aesthetic patterns into five stages throughout development. It was postulated that each stage is more sophisticated and advanced, both psychologically and aesthetically, than the previous one. This suggests that, with age and exposure, aesthetic preference becomes more sophisticated (Parson, 1987).

This theory is in line with our findings that sensitivity to fine changes in aesthetic stimuli develops over time. Moreover, results seem to reveal that the level of complexity in regard to musical modality is evident already at infancy, such that infants showed different preferential patterns for one aesthetic genre over another. The current findings showed that participants in all three groups showed more concentrated expressions during the Beatles aesthetic condition as compared with the Beatles non-aesthetic conditions. Alternatively, an opposite trend was seen for Beethoven, such that adults and caregivers showed less concentrated expressions in the aesthetic as compared to the non-aesthetic condition. Infants also showed the same trend as adults to a nearly significant level.

It is unclear why such differential patterns to aesthetics in various musical genres exist. Further studies are needed to fully understand this; however, one explanation may be explained by the notion of popular culture versus high culture. This theory underscores the complexity of high culture (Bourdieu, 2000), which is described as more complex and innovative work designed by experts for an expert audience; and the more simple nature of popular culture, described as more easily-accessible to the general audience (Gans, 2008). Based on this differentiation, it is possible that in the case of the current study modern and classical art may be perceived differently based on genre specific aesthetic patterns.

Along the lines of Parson's framework, it is plausible to extend this supposition to the musical realm. More specifically, it may be postulated that the genre specific aesthetic expressions arise from differences in the aesthetic level embodied in each genre, such that the Beethoven piece has more levels to analyze and more aesthetic degrees than the modern piece, and hence elicited a differential behavioral output than the modern one, which is often more accessible, simpler and more popular.

This leads to the conclusion that learning and exposure may influence the way we perceive aesthetic and non-aesthetic patterns in different musical genres. Interestingly, current findings showed that exposure to classic music at home influences the way both infants and adults respond to the aesthetic and the non-aesthetic patterns within the classical genre. The effect of exposure was age dependent: infants who were exposed to classical music showed behavioral patterns that indicated less interest in the non-aesthetic conditions as compared with those who were not exposed. At the same time, findings for the adults indicate that those who reported exposure to classical music showed more interest in the aesthetic condition as compared to those who reported no such exposure.

As suggested for visual art, the current data with musical pieces supports the notion that exposure reduces first the attractiveness of non-aesthetic forms and later on with development increases the interest in discovering more levels of aesthetics to gain a heightened sense of pleasure (Parson, 1987).

It might be that for this reason, classical music is perceived as more aesthetic the more we become exposed to it, since it has aesthetic elements in its structure at multiple levels. For this reason infants and less exposed participants may perceive it as less aesthetic relatively to adults and more exposed young participants.

In contrast, modern music art is easier to perceive as aesthetic since it is made up of less complex structures (Gans, 2008). It is plausible that breakups in the musical structure to create the non-aesthetic pieces were more obvious within the modern genre, making it easier to recognize as non-aesthetic patterns.

Thus it seems that exposure plays a crucial role in how we experience aesthetic patterns, especially when the musical piece has a 'high' art quality, evident in its mode of organization and its complexity. Importantly, the current study suggests that exposure to classical music already influences the perception of aesthetic and non-aesthetic music in young infants, an effect that reaches its peak in adulthood, pointing to the potency of the role of exposure to high art early on in development.

In summary, the current study sheds light on the way we perceive and experience aesthetic musical patterns from infancy through adulthood. It highlights the shared mechanism that is evident and shared between infants and adults in our interest in musical aesthetics and the continued development of this interest as we mature and gain exposure to a variety of patterns in music. Findings indicate that as seen in the visual realm, in music too, we are born with the ability to distinguish between aesthetic and non-aesthetic patterns, and with an overall preference of aesthetics, and that that preference is further modulated with maturation and exposure.

Future studies may uncover the factors affecting the differential genre dependent preferences to aesthetic structures, by taking into account cultural backgrounds, individual activated feelings that the music may evoke, as well as explore additional musical genres in order to broaden our understanding of how humans perceive aesthetic patterns.

**Acknowledgements**

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References


PART THREE: POSTER PRESENTATIONS
Teacher Motivations, Flow Experience and Aesthetic Appreciation in Teaching

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Abstract
Our hypothesis concerns the relevance of teacher motivations, including aesthetic experience and flow experience, in facilitating perception of self-efficacy in teaching. These variables can influence coping strategies for educational problems. 53 primary and secondary school teachers filled Self-Report Scales (Biasi & Bonaiuto, 2014) on motivation and quality of teaching experience. A Teacher Self-efficacy Scale (Italian adaptation by Biasi, Domenici & Patrizi, 2013) was also administered. The analysis showed that teachers with high teaching motivation declared they had flow experience and aesthetic experience more easily in their work along with high levels of professional self-efficacy. The results confirm the hypothesis that good job motivation (facilitating flow experience and aesthetic experience) is related to the ability to cope with the typical stresses of educational work.

Keywords: Evaluation, Flexible Integrated Didactics Strategy, Flow experience, Motivation, Teacher experience.

1. Antecedents, General Purposes and Hypotheses
The national project coordinated by Domenici in Italy (PRIN 2011) aimed to enhance actions to qualify education processes and results of formal education structures by training teachers with regard to integrated teaching methods. Its main objective was to experiment a flexible modular didactic strategy. The experimentation involved primary and lower secondary school teachers who had been appropriately “in-service trained” through an e-learning platform. The integrated didactic strategy takes the following factors into account: the flexibilization of the educational proposal, as a didactic-curricular adaptation not only to inter-individual diversities, but also to intra-individual ones; the inclusion of students with disabilities or Special Educational Needs; the treatment of learning difficulties of psychogenic origin; the arrangement of contexts for the inclusion of immigrants and for the promotion of gender identity.

Our hypotheses concern the relevance of teacher motivations, including aesthetic experience and flow experience, in facilitating teaching strategies and perception of self-efficacy in teaching. High level motivation in teaching represents the condition for applying the flexible modular didactic strategy. We also studied the role of self-efficacy perception in teaching. These variables can influence coping strategies for educational problems.

2. Method, Procedure Instruments, Participants
Within the teacher training to develop didactic competences, the project used specific self-report scales (Biasi & Bonaiuto, 2014) of indicators focusing on motivation and quality of teaching experience in terms of aesthetic appreciation and perception of flow experience (Csikszentmihalyi, 1975). A Teacher Self-efficacy Scale (SAED, Tschannen-Moran & Woolfolk Hoy, 2001: Italian translation and adaptation by Biasi, Domenici & Patrizi, 2013) was also administered. 53 questionnaires were administered to primary and secondary school teachers (average age: 42 years; 9 months).


These scale include a list of eleven-point bipolar scales (from 0 to 10 points; fig. 1) centering on the main motivations, among the various contributions we used a list from the nine motivational systems devised by Bonaiuto (1967).

Fig. 1
Here are the instructions given to the participants for completing the *Self-Report Scales*:

“Spontaneously indicate which of the following motivations, with the relative goal-objects, you think affect your work as a teacher and also some of the aspects of teaching experience that involve you. You can indicate how much you feel these things influence you by choosing a score ranging from 0 (absence of the need or aspect) to 10 (the maximum intensity perceived)”.

- **Motivation to Sociality**: including aspects of relations of attraction with the “other” and moments of sociability.
  
  *Goal-object*: positive social relations, coexistence, collaboration.

- **Motivation to Self-assertion**: expressed in behaviors geared to affirming oneself, tending towards goals experienced as positive for reaching a position of self-excellence.
  
  *Goal-object*: self-emergence, excellence, experiences of success, possession, duration, personal value

- **Motivation to Aggression**: expressed in behaviors geared to degrade (devalue) structures perceived as external to the operational ego.
  
  *Goal-object*: degradation of structures, trivialization, destruction.

- **Motivation to Adventure**: shown through the search for strongly conflictual situations, of high emotional tension, as opposed to situations of emotional flatness.
  
  *Goal-object*: the search for adequate emoziona tensions (propensity to risk, hazard and adventure).

- **Motivation to Knowledge**: concerns the need to gather information and to form mental concepts or schemas. It includes aspects of ordered knowledge (convergent thinking) and varied knowledge or creativity (divergent thought, exploration, imagination).
  
  *Goal-object*: information acquisition and mental schema development.

- **Motivation to Construction**: geared to the designing and implementation of concrete structures.
  
  *Goal-object*: creation of concrete structures, designing, implementation, conservation, repair.

- **Motivation to Movement**: concerns the need to move, to change position in space. It includes aspects linked to the functional pleasure that active movement produces.
  
  *Goal-object*: control and modification of the body’s position in space.

In order to test the quality of teaching experience in terms of aesthetic appreciation, and the perception of flow experience, we listed the following items:

- **Perception of aesthetic experience**, characterized by the search for aesthetic pleasure in conducting teaching activities.
  
  *Goal-object*: experiencing beauty in teaching.

- **Perception of flow experience or optimal experience**: this condition is characterized by the individual’s great involvement focusing on a goal, by great intrinsic motivation and cognitive efficiency (high concentration and activation), by a positive affective state and experienced satisfaction in performing a particular task. The flow concept was first introduced in 1975 by the psychologist Mihály Csikszentmihályi with the *theory of the flow of consciousness*, to then spread to various fields of application of psychology and education.
  
  *Goal-object*: reaching an optimal state of pleasant concentration and commitment in an activity, and specifically in teaching activities, as an optimal perceived point of equilibrium between environmental challenges and personal capacities.

II. Teacher Self-efficacy Scale (SAED) (Tschannen-Moran & Woolfolk Hoy, 2001: Italian translation and adaptation by Biasi, Domenici & Patrizi, 2013). Teacher efficacy has proved to be related to many educational outcomes as teachers’ persistence, enthusiasm, commitment and instructional behavior. This Scale is consistently found on three factors: *Efficacy in Student Engagement* (8 items), *Efficacy in Instructional Strategies* (7 item), and *Efficacy in Classroom Management* (3 items). We can see the specific items for the three teacher efficacy subscales (engagement, instruction ad management) (Fig. 2).
3. Results

Firstly, the Self-Report Scales on motivation and quality of teaching experience enable us to delineate a teacher’s average motivational profile (Table 1).

Table 1 - Mean scores and standard deviation (in brackets) recorded by 53 teachers with Self-Report Scales

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sociality</td>
<td>8.85</td>
<td>(1.22)</td>
</tr>
<tr>
<td>Self-Assertion</td>
<td>7.31</td>
<td>(1.87)</td>
</tr>
<tr>
<td>Aggression</td>
<td>3.02</td>
<td>(3.58)</td>
</tr>
<tr>
<td>Adventure (Conflict)</td>
<td>4.98</td>
<td>(3.15)</td>
</tr>
<tr>
<td>Knowledge</td>
<td>8.85</td>
<td>(1.32)</td>
</tr>
<tr>
<td>Construction</td>
<td>8.25</td>
<td>(1.64)</td>
</tr>
<tr>
<td>Movement</td>
<td>7.46</td>
<td>(2.31)</td>
</tr>
<tr>
<td>Aesthetic Experience</td>
<td>7.92</td>
<td>(1.83)</td>
</tr>
<tr>
<td>Flow Experience</td>
<td>8.81</td>
<td>(1.37)</td>
</tr>
</tbody>
</table>

The highest scores are recorded with motivation to “Sociality”, “Knowledge” and “Construction”, and with regard to Aesthetic Experience and Flow Experience. It is thus possible to delineate an average motivational profile geared to openness towards relations with the other, in terms of interpersonal relations and of acceptance of the relation with the object world (including knowledge objects). Achieving the relative goal-objects of these motivational components, through teaching activity, makes aesthetic appreciation possible when performing one’s tasks and, not less important, the process of pleasant involvement and productive immersion (Flow Experience).

Ranking second (with slightly lower average scores) we find motivation to Movement and, in particular, motivation to Self-Assertion, which generally does not electively characterize the teaching profession that is more motivated to knowledge (cultural growth) and empathy as well as support in the other’s development.

Next we find motivation to Adventure, also called motivation to Conflict, in the sense of seeking a moderate degree of anxiety which can be experienced in things such as supporting a performance or which is useful in sustaining curiosity and cognitive engagement, without which the individual would remain in a sort of emotional flatness of a regressive nature.

Ranking last is the motivation to Aggression, which has very low scores, in line with the complementary and largely constructive drive levels typical of the teacher’s average motivational profile.

With regard to teacher Self-Efficacy, the sample of respondents had the average scores shown in Table 2.

Table 2 – Mean scores and standard deviations (in brackets) recorded by 53 teachers with Self-Efficacy Scale (SAED)

<table>
<thead>
<tr>
<th>SAED sub-scale scores and total score</th>
<th>Mean</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student Engagement</td>
<td>56.28</td>
<td>(10.91)</td>
</tr>
<tr>
<td>Instructional Strategies</td>
<td>57.94</td>
<td>(10.72)</td>
</tr>
<tr>
<td>Classroom Management</td>
<td>54.40</td>
<td>(11.55)</td>
</tr>
<tr>
<td>Total Score SAED</td>
<td>168.62</td>
<td>(31.95)</td>
</tr>
</tbody>
</table>

To assess relations between the perception of Self-Efficacy
and the Motivational Profile and quality of teaching experience of the teacher, we extracted opposing groups consisting of participants with High Level Self-Efficacy versus Low Level Self-Efficacy. We therefore selected 11 participants with scores equal to or greater than one standard deviation above the SAED mean (201 points) and 8 participants with scores equal to or lower than one standard deviation below the SAED mean (137 points). Table 3 shows the corresponding profiles.

Table 3 – Mean scores and standard deviation (in brackets) of High Level Self-Efficacy teachers versus Low Level Self-Efficacy teachers with respect to Motivational Profile and quality of teaching experience.

<table>
<thead>
<tr>
<th>Motivational Profile</th>
<th>High Level</th>
<th>Low Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAED Total scores</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher Self-Efficacy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Level</td>
<td>9.55</td>
<td>8.25</td>
</tr>
<tr>
<td>N = 11</td>
<td>(0.69)</td>
<td>(1.58)</td>
</tr>
<tr>
<td>Sociality</td>
<td>6.36</td>
<td>6.88</td>
</tr>
<tr>
<td>N = 8</td>
<td>(2.77)</td>
<td>(2.53)</td>
</tr>
<tr>
<td>Self-Assertion</td>
<td>0.18</td>
<td>2.38</td>
</tr>
<tr>
<td>N = 8</td>
<td>(0.60)</td>
<td>(2.39)</td>
</tr>
<tr>
<td>Aggression</td>
<td>5.18</td>
<td>2.88</td>
</tr>
<tr>
<td>N = 11</td>
<td>(3.71)</td>
<td>(2.74)</td>
</tr>
<tr>
<td>Adventure (Conflict)</td>
<td>9.73</td>
<td>7.88</td>
</tr>
<tr>
<td>N = 11</td>
<td>(0.65)</td>
<td>(1.64)</td>
</tr>
<tr>
<td>Knowledge</td>
<td>8.82</td>
<td>7.13</td>
</tr>
<tr>
<td>N = 11</td>
<td>(2.14)</td>
<td>(2.17)</td>
</tr>
<tr>
<td>Construction</td>
<td>6.82</td>
<td>6.13</td>
</tr>
<tr>
<td>N = 11</td>
<td>(2.71)</td>
<td>(2.48)</td>
</tr>
<tr>
<td>Movement</td>
<td>7.55</td>
<td>5.25</td>
</tr>
<tr>
<td>N = 11</td>
<td>(2.66)</td>
<td>(1.04)</td>
</tr>
<tr>
<td>Aesthetic Experience</td>
<td>9.18</td>
<td>5.50</td>
</tr>
<tr>
<td>N = 11</td>
<td>(1.83)</td>
<td>(0.76)</td>
</tr>
</tbody>
</table>

Starting from the hypothesis that teachers with high scores in the SAED also have high scores in the motivation test and, in particular, for certain specific motivations, we proceeded as follows. The sample of teachers who participated in the study was subdivided into two subgroups: - “Highs”: teachers obtaining high mean scores in the SAED; - “Lows”: teachers obtaining low mean scores in the SAED.

We then compared the different scores obtained by the two subgroups in the motivation test. The performances were estimated by means of re-sampling techniques. In particular, a bootstrap interval was calculated. In this specific case, the implicit null hypothesis was that there is no difference between the “Highs” and “Lows”. Once having established a confidence interval of α=0.05, the bootstrap interval in the motivation to knowledge, for the “Highs”, was [9.27-10.00], and thus greater than the bootstrap interval calculated for the “Lows” [6.75-8.88]. Moreover, in the specific case of the perception of flow experience, the “Highs” obtained a bootstrap interval of [8.09-10.00] while the “Lows” obtained [5.13-6.00]. Significant differences were also found with regard to motivation to aggression (“Highs” [0.00-.55]; “Lows” [1.00-3.88]). Since the two intervals in these cases did not overlap, it is possible to accept the null hypothesis, that is, we can state that there is a statistically significant difference between the two groups in the three specific motivations described. In other words, the teachers with high self-efficacy scores have better scores, on average, in motivation to knowledge and in their perception of flow experience compared to teachers with low scores in the SAED. On the other hand, with regard to motivation to aggression, the two subgroups had the opposite behaviour: the “Highs” obtained lower scores compared to the “Lows”.

The results obtained confirm the initial hypothesis of a correlation between SAED scores and the teacher’s “positive” motivational level.

Our analyses show that the participants belonging to the subsample High Level Self-Efficacy teachers have high scores in motivation to Sociality, Knowledge and Construction as well as in their perception of aesthetic experience and flow or optimal experience. If we consider the averages of the subsample for the aforesaid variables, we see a direct linear relation: as SAED results increase, the results of the aforesaid specific motivations also increase proportionately.

With reference to the subsample Low Level Self-Efficacy teachers, we see systematically lower scores, particularly with regard to aesthetic perception and flow experience. This group of participants has a higher score in motivation to Self-assertion, and particularly in the motivation to aggression. These are indirect indicators of a probably more egocentric and intolerant personality, which is thus less suitable for the teaching profession that is probably less appealing and less positively absorbing compared to teachers with high scores in Self-Efficacy.

4. Conclusions

As said before, the Self-Report Scales on motivation and quality of teaching experience enable us to also delineate the teacher’s average motivational profile, centered especially on specific constructive drives as like the motivation to “Sociality”, “Knowledge” and “Construction”. This
motivational profile favors a professional profile characterized by aesthetic experience and flow experience. Finally, the analysis showed that teachers with high teaching motivation declared they had flow experience and aesthetic experience more easily in their work along with high levels of professional Self-Efficacy. The results confirm the hypothesis that good job motivation (facilitating flow experience and aesthetic experience) is related to the ability to cope with the typical stresses of educational work.

References


The article is the result of the joint work of the three authors, G. Domenici wrote the paragraph 1; N. Patrizi the paragraph 2; V. Biasi th paragraphs 3 and 4.
A Possibility to Develop “SSM-School Sky Museum”

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Abstract
This paper examines and critiques websites from both national and international higher education arts related disciplines, and develops the possibility of Taiwan’s “school sky museum.” By case studying DYU’s design and arts college’s skymuseum, this paper will discuss the arts, aesthetic and educational value of a “schoolsky museum.”

Keywords: museum; virtual museum; school museum; school sky museum.

For most of history, museums have fulfilled the function of “collecting”, “researching”, “displaying”, “entertaining,” and “educating” art and the public in terms of the ecology of arts’ production and consumption. With the development of technology, virtual museums have been born. This type of museum reached wider audiences than previous physical museums could have. Especially within the past ten years, the diversity and versatility provided by the technology to display virtual objects and spaces has long bypassed any physical objects’ capacity. The quality of this medium and the virtual aspect of these type of “sky display” have become the way contemporary society transmit and share information. Displaying is no longer exclusive to museums. Particularly, most public institutions have been utilizing this concept of “virtual museum” to educate and communicate specialty of the institution. For instance, all level of schools, government or non-government institutions, or commercial company’s website are all, in some sense, applying the essence of “virtual museum.” They have obtained the statues of “quasi-virtual museum.” If we take away the “collections” and temporary displaying objects, a museum becomes a “shell.” In other words, the museum itself does not fulfill the actual productivity of an “art object.” On the contrary, all level of schools, especially higher education that cultivate arts related human resources, maintain the function of producing “art objects.” Plus, from the perspective of art and aesthetic education, “documents and products” produced by arts related disciplines’ curriculum and teaching is the “art object” within the arts’ ecology. Besides the function of museums, school also maintains the function of production and creating consumption. However, due to limited funding and spaces, or contemporary concerns, schools do not need to own a museum itself. Instead, schools should develop “sky museum” in terms of their personal specialty.
Reflection on the Development of Globalized City Space and Community-Based Art Education

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Abstract
The globalized cultural and economic form of space has been considered a crucial issue in the past decades, and the concept of “creative city,” therefore, has gradually become hotly discussed. For such an issue, the author, from Taipei Municipal Datong High School, conducted an experiment on art education by integrating emerging technology in the curricular module with an attempt to build the linkage between global and local culture. The reflection on the curriculum is also given after the course conduction.

Keywords: Globalized City, Emerging Technology, CBAE

Introduction
Community-oriented art education thoroughly discusses the pattern and relationship among art, culture, and community environment from the perspectives of art and diverse culture (Mcfee, 1998). Community-based art education is derived from the perspective of multi-cultural education—teachers guide students to explore the culture and resources in the community. However, community space in fact is a complex compound. For instance, the essence of space in countryside greatly differs from that in a city. This paper aims to discuss the complicated forms of city spaces and the curricular module of community-based art education.

Under the influence of globalization, such as the gradual change of the economic body from the era of industrialization to post-industrialization, studies and discourses on economics in global cities thus arose. Meanwhile, discourses on cultural dimensions also came into place. Cultural globalization has been a crucial issue in recent decades, and the so-called “creative city” has gradually become a hot concept. In the discussion of such topics as globalized cities, it is worth thinking whether in the global city space, the present community-based art education has created new thoughts for the art education of city space. Following the idea, we conducted a series of experimental art education curriculum by incorporating emerging technology so as to explore the possibility of bridging global and local culture. The discussion questions include: What are the characteristics of city spaces under the impact of globalization? What are some possibilities generated in educational aspects? What is the ideal curricular module for city space-oriented art education and the limits to it?

Globalization and the Structure of City Spaces
The term “globalization” first appeared in the article by Theodre Levitt discussing the global spread and influence of economic production. However, the concept of globalization actually covers concepts in various domains. According to Tomlinson (2006), globalization refers to the process of the rapid development of how different societies, cultures, systems and individuals complicatedly interact with one another. It has much to do with the compression of time and space: “The vast majority of us live local lives. But the impact of globalization is to change the very texture of this locality and therefore the nature of cultural experience in general. No longer is culture ‘tied’ to the constraints of local circumstances (Tomlinson, 2006).”

For example, under the influence of globalization, some cities gradually became global cities, and such transforming process is still persisting. To view from a cultural perspective, many discourses have been raised to reflect on the negative impact of globalization. Taking cultural imperialism for example, the cultural export from powerful countries will cause cultural damage to developing countries. However, the process of globalization also highlights the local perspectives of a culture. According to Kevin Robins, the globalization of economic activities leads to the possibility of cultural transformation. However, the process of cultural globalization is more than just cultural convergence, and it rather occurs with localization and globalization simultaneously, which is a process of infiltration between homogeneous and heterogeneous cultures.

Globalized Creative Classes and the Aggregation in Regional Space
The development of the main cities around the world nowadays can in no way get away from cultural creativity, for the third industry has taken a huge part of urban industries. Cultural creativity is exactly the core element of the third industry. Taking cultural activities and designs in different domains for example, the concept of “Symbolic economy” has been taken as a strategy responding to global competition and the tension in local areas (Sharon Zukin, 2004). Under the influence of globalization, every city makes great efforts to qualify themselves as a crucial node in the global economic network. Every city needs to gain approvals and tries to appear on the radar charts at their best so as to accumulate the wealth and enhance the future potential of the city (Charles Landry, 2011). Such phenomenon has indicated that the major way to become a global city is to build the sound environment and industry of cultural creativity.

For the aggregation of creative talents, Richard Florida (2003) pointed out that a creative environment is not only a place with creative talents and products, but also an area that demonstrates the energy of the entire region. Factors that attract creative talents has transformed from transportation,
shopping and recreation to innovative technology, liberty and diversity, and the identification with creative talents. He also pointed out that he flow and gathering of creative talents has much to with the technology, talent, and tolerance in the space, and it is because of having such a quality of tolerance that the creativity in all forms is enabled to grow and develop in the thriving creative environment.

Aiming at the flow of creative class, cities nowadays place more emphasis on diverse culture and the construction of creative space, for cultural facilities and environmental quality are the essential factors that attract creative talents, and they also promote the industrial and regional development (Florida, 2010). From the construction of city creative space, it is not difficult to find that just as how globalization destructs the power of a country, the building of creative environment can in no way be planned and conducted solely in a top-down method. Instead, it is vital to collectively imagine the local diverse cultural features. Cities should be viewed as an organism with complex orders, and to deal with the complicated problems of city planning, it is required to start from the interior (functions) rather than the exterior (appearance and form) so as to bring life and energy to the city (Jane Jacobs, 2011).

Therefore, the planning for the public space in cities has gradually changed from the power-holders’ perspective to a bottom-up construction of cultural space, and the manifestation of local cultural features is encouraged. With the efforts made by many frontiers in recent years, the civil and commercial space in Taiwan has gradually been more valued, so we should further think of ways to have people identify with the concept of building public space and forming space cultures through education. Globalization should not only be realized in city environment but also connect to citizens’ everyday life. As the major habitat and place for consumption, cities should further highlight the core status of humans in city environment.（吳鄭重, 2004）

**Thoughts on Art Education and the Space Culture in Local Cities**

While the process of globalization contributes to the time-space compression through transportation technology and the broadcasting of information technology, it also gives rise to the sense of detachment toward the traditional concept of space as well as the sense of crisis toward the disarticulation from the traditional local life experiences (David Harvey, 1989). Compared with that in the past, community-based art education nowadays has generated some issues worth discussing. To view from the perspective of glocalization, is it possible to explore the localization of curriculum with media technology? By incorporating technology into community-base art education, the curriculum puts great emphasis on the exploration of local culture and the use of local learning resources. In addition to the experiment of art itself in real space, technology and subjectively creative activities also help learners in the curriculum develop the concept of “placeness”（潘朝陽, 1996）.

Just as what has been emphasized previously, the powerful effect of cultural globalization should give thanks to the role media technology plays in cultural broadcast, which quickly compresses our time and causes the implosion of the broad spiritual world of image and concept (Mcfee, 1998). Nevertheless, if media technology can be used to help explore the possibility of local culture, we will be able to highlight local culture and avoid the one-dimensional world cultural hegemony. Therefore, what we have been emphasized is the bidirectional connection and exploration through the use of technology.

Richard Florida has suggested that in the competition among globalized cities, strategies need to be applied to create an environment for the gathering of creative talents. What’s more, the educational system, universities, can play an important role that cultivates creative talents. According to Florida, other than creating economic development with innovative technology, decision makers in universities should consider how to build an attractive learning environment (Florida, 2005). From educational perspectives, the cultivation of creative talents cannot be solely planned to achieve a self-interest oriented short-term benefit. While universities have much more resources beneficial for promoting industry-academic cooperation and environmental construction, it is still important to cast spotlight on primary and secondary education. As students are still discovering their aptitude in the learning stages, we should never solely put emphasis on intellectual education and thus sacrifice the thoughts and exploration of diverse learning. Hence, in whatever learning stages, the connection between education and the environment should in no way be neglected.

Cities lie in the space carrying features of both glocalization and lobalization, and we should start with the local cultural features and find the relative position on global culture by building the connection among art, technology and education. It is a challenge worth making efforts to construct a glocalized and city-based space so as to manifest the local space and culture as well as attracting and cultivating creative class.

**Case study: The Curriculum Module of Community-based Art Education in Taipei Municipal Datong High School**

**The Background of Taipei Municipal Datong High School**

Taipei Municipal Datong High School is located in Zhongshan district in Taipei, Taiwan. Near the school, there are Siping Sun Square Market (Yitong community) and buildings of mixed residential and commercial use. Datong is a comprehensive junior-senior high school, with most of its students of junior section coming from neighboring communities and students of senior high section coming from neighboring and other communities respectively. The curriculum module designed by the author takes the surrounding community of Taipei Municipal Datong High School as the center, and emerging technology is
incorporated into the teaching. Through the course experiments, the author attempted to discuss and reflect on the practice of the community-based courses in the city, and further enhance students’ perception and awareness of the environment.

The core of the module is the final production made by students, and this is also the base of the entire course design. The course began with the cognitive domain by motivating students with the use of examples in the community, guiding students with knowledge of art history and art appreciation. Students were later then grouped and continued on with the follow-up discussion and creation.

As the curriculum centers on the space around the campus, the author took students to have a field trip in the community so as to help students observe and take notes in such experiential learning. The author then conducted creative thinking courses and designed worksheets to help students with their creating courses with the aid of media technology.

The role media technology played in the course is a connector. The multi-media assisted in the teaching of cognition and art appreciation, and the digital media also helped students with the spatial design.
Students’ Creativity in Connection to the Community

The author conducted a series of courses in Taipei Municipal Datong High School, and from students’ creation in response to the community and the environment, it is not difficult to find how creative and skillful the students are.

The Cool Play of City Image

In this course, students learned to create artworks by using digital media. In the process, students were taught to discover the cultural issues behind the images taken in the community from a meta-cognitive perspective. And finally, students took the images taken in the community as the material and created digital artworks with various motifs.

Figure 10: Students’ creation “Battles of Car Destruction”

Figure 11: Students’ creation “City Jungle”

Green Creativity and Symbiotic Constructions

The course centered on the creative innovation of the green buildings in the community. In the beginning, architecture design and sustainable design were taught in class, and students then took a field trip to the community for further research and survey. Students completed the work by digital 3D drawing, and they recorded the presentation of the work so as to demonstrate and have a conversation with the local residents in festive activities in the community.

Creative Street Furniture

What makes the huge gap in our cognition of the aesthetics between private space and public space? The author’s courses took the creation of street furniture as the core, and
students explored the community and find out objects that interested them in the environment. From the perspective as a designer, students created street object with cultural features as well as design thinking.

![Creative street furniture designed by student LIN,YI-SYUAN](image1)

![Bus-stop designed BY CHEN ,GUAN-YU, ZHOU,CHENG-HAN](image2)

**Results**

The result can be discussed from three aspects: students, school, and residents in the community.

To begin with, students learned more about the community from different perspectives and further have their own community environment-oriented creation, including filming of community stories, design of green architectures and street furniture in the community, writing theme songs for the community, and printing 3D community toy figures.

The second aspect is the curricula in school that cast spotlight on cultural creativity and environment, including applying for campus resident artists, executing “WDC—Project of Campus Aesthetic Corner,” and constructing green roof so as to have qualitative and quantitative interaction with the community.

The last aspect aims at the interaction and the concern for the local residents in the community. The concept and activities of localizing the cultural design have been infiltrated in the community through our holding several festive events such as the school anniversary exhibition, community creative potting design exhibition, drive-in theater, and celebration activities for Mother’s day (as Yitong community is featured as “women’s street”).

**Discussion: The Practice and Reflection on the Community-based Curriculum Module**

From the experience of the courses, it is suggested to pay extra attention to the following aspects when conducting an experiment on such a community-based curriculum module:

**The Incorporation of Information Technology into Teaching**

Just as mentioned previously, the connection media technology can help build is an important medium for future experimental spatial art education. However, the access to sufficient teaching equipment is also something teachers need to work on. Especially with the limited school budget, teachers are often required to apply for relevant project so as to get subsidy. In the author’s case, while the author gained the subsidy from additional projects, some computer equipments were still acquired from the revocatory computers that were out of the estimated physical life. With the mature development of the computer hardware nowadays, most revocatory computers can in fact still be put in service.

**Meta-thinking on Cultures**

It is undeniable that the modern society is filled with media digital images of all kinds. To practice art education of spatial environment, it is a must for teachers to have flexibility and transformability so as to immediately reflect on the perceived visual images and help students know more about the diverse culture embedded in the visual images and further nurture students’ critical thinking abilities.

**The Emphasis on Students’ Learning Differences**

Students’ learning differences may result from the different abilities of painting or aesthetics, etc. Also, during the process of the community-based curriculum, as the class may be composed of students both from the neighboring communities as well as non-neighboring ones, it is suggested that heterogeneous grouping be adopted so that students from the neighboring communities can be evenly distributed in each group. In response to the development of the 12-year compulsory education in Taiwan, whether the distinction between community high schools and elite high schools will be blurred is still worth observing.

**Cross-field Cooperation**

To nurture students’ diverse knowledge and various abilities, it is inevitable that teachers take multiple cooperative approaches. The term “cross-field” here refers to the cooperative teaching among subjects as well as the stepping out of campus into the community. All these aim to help students examine and practice the knowledge they acquired.
in class. Also, as cites often carry diverse features, if such features can be combined and promoted with community characteristics, it would also help produce the additional value in cultural marketing.

With a view to globalization and localization, the global city space needs greatly the connection among art, technology, and education to boost the competitiveness and take root in the local culture, and this is exactly why the author persists with the curriculum experiment.

What such experimental education has influenced is more than students in the class. Through students’ works and actions, it has also gradually influenced the residents and the environment in the community, formed and refined in the flow of time, which, in other words, needs our perseverance and consistent efforts.

Acknowledgments

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Order in Paintings and Aesthetic Evaluations

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Abstract
This study examines order in paintings and how it relates to aesthetic evaluations. First, we analyzed the components of visual order in paintings. The result suggested that order in paintings is composed of regularity and complexity. Second, we examined the relationship between order in paintings and aesthetic evaluations. The association of aesthetic evaluation with regularity exhibited an inverse U-shape. Complexity was not found to be associated with aesthetic evaluation. Finally, we found a predictive equation calculated for the aesthetic evaluation of paintings (y) was: $y = 5.03 - 0.22 \times \text{regularity principal component score}^2 + 0.08 \times \text{complexity principal component score}^2$. In conclusion, aesthetic evaluations being the highest when order in the painting was moderate.

Keywords: paintings; order; aesthetic evaluations

Introduction
There are numerous paintings that are considered beautiful by most people. For example, the Mona Lisa, one of Leonardo da Vinci’s masterpieces, is the most admired and famous among the approximately 7,500 pictures in the Louvre. Moreover, works of internationally popular painters such as Gogh, Picasso, and Monet, among others are exhibited not only in Europe, but also in museums around the world, and they are widely popular. Ichihara (1971) indicated that masterpieces of painting tend to be liked by most people. It is known that certain paintings have been highly evaluated internationally and throughout the ages, which suggest the possibility of certain laws of beauty being inherent in these works of art. Have painters introduced laws of beauty into their works either intuitively, or through empirical knowledge, by using their gifts or highly developed skills?

Ramachandran (2011) argued that the existence of principles and universal laws of beauty beyond culture is the basis of diversity in art. He suggested that order could be one of the nine universal laws of beauty, which also includes contrast and symmetry. Birkhoff (1932,Nadal et al.(2010)) examined the relationship between order, complexity of stimuli and beauty, by using various polygonal figures as stimuli and reported that an object is the most beautiful when there is a high degree of order and complexity (i.e. beauty = order ÷ complexity). Moreover, Eysenck (1941) investigated geometric figures and suggested that an object is the most beautiful when both order and complexity were high (i.e. beauty=order × complexity). These findings suggest that the order in objects effectively predicts beauty. On the other hand, Eibl-Eibesfeldt (1988) postulated pictures that were obviously orderly lacked beauty. As indicated above, findings regarding order and evaluation of beauty have not been consistent. Birkhoff (1932, Nadal et al.(2010)) defined order in polygonal figures as consisting of upper and lower symmetry, balance, radial symmetry, relationship between vertical and horizontal grid lines, and insufficient shapes. However, order of pictures has not been sufficiently defined. Moreover, components of order have not been investigated to date.

This study investigated relationships between order and aesthetic evaluations of paintings, focusing on order in paintings as a universal that determines evaluation. Participants were undergraduate and graduate students that had no experience in evaluating paintings. In Study 1, a newly developed adjective-pairs scale based on the SD method was used to assess order in paintings. In Study 2, participants were required to evaluate each scale by looking at paintings using the scale developed in Study 1 and a scale for evaluating pictures. First, the components of order in paintings were investigated and next the relationship between order and aesthetic evaluations was examined based on each component. Finally, based on the above results, formulas for predicting the aesthetic evaluation of paintings were developed.

Study1
Developing the Order in Paintings Scale

Methods

Participants Undergraduate and graduate university students (N=73: 59 women and 14 men) participated. All participants were psychology majors, who and they had not received any formal training in art.

Measures Yoshimura (2012) translated the Implicit and Explicit Features of Paintings Scale, which is based on the scale originally developed by Marković and Radonjić (2008), to Japanese. The translated scale consists of 68 items that includes four factors consisting of Implicit Features subscale (25 items) and four factors consisting of Explicit Features subscale (43 items).

Procedure Participants were asked to rate adjective pairs
from the Implicit and Explicit Features of Paintings Scale on a 3-point scale to indicate the degree of visual order in paintings. Paintings were not actually presented when participants to rate.

The following written instructions were given to the participants: A series of 68 adjective pairs will be presented. Your task is to rate the 68 adjective pairs in the following rating scale to indicate the visual order in paintings according to your own criterion.

(e.g.) arranged — chaotic


Results

Tables 1 and 2 summarize the ratings of visual order in paintings. We calculated the percentage of participants that rated order in paintings and decided to use the adjective pairs in which the rated order in paintings was more than 70%, in order to develop the new scale. As a result, a Semantic Differential (SD) Scale composed of 16 adjective pairs consisting of 9 items of explicit features and 7 items of implicit features was developed. The new scale was named the Order in Paintings Scale.

### Table 1. Rate of Order of Explicit Features

<table>
<thead>
<tr>
<th>Adjective pairs of explicit features</th>
<th>Rate(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>realistic — abstract</td>
<td>88.2</td>
</tr>
<tr>
<td>symmetric composition — asymmetric composition</td>
<td>80.3</td>
</tr>
<tr>
<td>color contrast — color gradients</td>
<td>75.0</td>
</tr>
<tr>
<td>neat — messy</td>
<td>73.7</td>
</tr>
<tr>
<td>clear — blurred</td>
<td>73.7</td>
</tr>
<tr>
<td>strong contours — weak contours</td>
<td>73.7</td>
</tr>
<tr>
<td>spatial depth — no spatial depth</td>
<td>72.4</td>
</tr>
<tr>
<td>multicolored — unicolored</td>
<td>72.4</td>
</tr>
<tr>
<td>straight — squiggy</td>
<td>72.4</td>
</tr>
</tbody>
</table>

### Table 2. Rate of Order of Implicit Features

<table>
<thead>
<tr>
<th>Adjective pairs of implicit features</th>
<th>Rate(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>arranged — chaotic</td>
<td>82.9</td>
</tr>
<tr>
<td>severe — mild</td>
<td>76.3</td>
</tr>
<tr>
<td>dynamic — static</td>
<td>75.0</td>
</tr>
<tr>
<td>clear — blurred</td>
<td>73.7</td>
</tr>
<tr>
<td>complex — simple</td>
<td>73.7</td>
</tr>
<tr>
<td>clear — vague</td>
<td>71.1</td>
</tr>
<tr>
<td>multicolored — unicolored</td>
<td>71.1</td>
</tr>
</tbody>
</table>

Study 2

### Aesthetic Evaluation and Order in Paintings

#### Methods

**Participants** Undergraduate and graduate university students (N = 64; 43 women and 21 men) participated in this study. All participants were psychology majors, who had not received any formal training in art.

**Measures**

**Order in paintings** A 16-item Order in Paintings Scale, developed in Study 1 was used to measure the visual order in paintings. This scale consists of adjective pairs based on the SD method.

**Aesthetics evaluations** Six adjective pairs (pleasant—unpleasant, beautiful—ugly, good—bad, like—dislike, interesting—boring, enjoyable—not-enjoyable) was used to produce ratings of aesthetic evaluation of paintings, based on Osgood, Suci, and Tannenbaum (1957). This scale also used adjective pairs based on the SD method.

**Stimuli** With reference to methods used by Marković and Radonjić (2008), we used paintings in two categories that were downloaded from the Internet. These included 6 paintings of Figural Realism and 6 paintings of Abstract Art, resulting in a set of 12 paintings in two categories that were used as stimuli. The artists, titles and year of the paintings are shows in Table 3.

These stimuli were printed in color on A4 paper. The sizes of landscape paintings were 12.3cm to 15.1cm in length and 18.2cm to 22.7cm in width, whereas portrait paintings were 18.5cm to 20.0cm in length and 14.3cm to 16.6cm in width. All sets of stimuli were presented in random order.

**Procedure**

For each of the 12 stimuli, participants were asked to evaluate the order in paintings using the Order in Painting Scale and to evaluate their aesthetics using the aesthetics subscale (6 items). Responses were scored on a 7-point scale.

The following written instructions were given to the participants: A series of paintings will be presented to you. Your task is to rate the paintings, according to your own criterion, using the adjective pairs in the following rating scale.

(e.g.) like—dislike

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definitely No</td>
<td>Definitely Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>No.1</td>
<td>No.2</td>
<td>No.3</td>
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<td></td>
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</tr>
<tr>
<td>John Everett Millias</td>
<td>John Constable</td>
<td>Jacques-Louis David</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>«The Bridesmaid (1851)»</td>
<td>«Arundel Mill and Castle (1837)»</td>
<td>«The Sabine Women Enforcing Peace by Running Between the Combattants (1794-1799)»</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>No.4</th>
<th>No.5</th>
<th>No.6</th>
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</thead>
<tbody>
<tr>
<td>Gustave Caillebotte</td>
<td>Vermeer Van Delft</td>
<td>Francisco de Zurbaran</td>
</tr>
<tr>
<td>«Paris Street, Rainy Weather (1877)»</td>
<td>«The Music Lesson (1662-1665)»</td>
<td>«Still Life with Pottery Jars (XVII century)»</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.7</th>
<th>No.8</th>
<th>No.9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthur Dove</td>
<td>Paul Klee</td>
<td>Viktor Vasarely</td>
</tr>
<tr>
<td>«Me and the Moon (1937)»</td>
<td>«Farbtafel / Coulored Chalkboard (1930)»</td>
<td>«Vega blue (1968)»</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.10</th>
<th>No.11</th>
<th>No.12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antoni Tapies</td>
<td>Lucio Fontana</td>
<td>Jackson Pollock</td>
</tr>
<tr>
<td>«Aile Blanche (1963)»</td>
<td>«Concetto spaziale, Attesa (1963)»</td>
<td>«Number 1 (Lavender Mist) (1950)»</td>
</tr>
</tbody>
</table>
Results
Structural Components of Order in Paintings
We examined the structural components of order in paintings. We obtained data on three aspects of paintings, (adjective pairs × paintings × participants), however, we analyzed only two aspects (adjective pairs × paintings × participants).

We conducted a factor analysis with Promax rotation on explicit features (9 items) and implicit features (7 items), which extracted 3 factors from each scale. The loadings of these items are shown in Tables 4 and 5. Factor analysis of ratings on the explicit features of paintings subscale indicated three dimensions and implicit features of paintings subscale indicated three dimensions.

Table 4. Component score of Explicit Features Scale

<table>
<thead>
<tr>
<th>Explicit features</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>clear</td>
<td>—</td>
</tr>
<tr>
<td>strong contours</td>
<td>—</td>
</tr>
<tr>
<td>straight</td>
<td>—</td>
</tr>
<tr>
<td>color contrast</td>
<td>—</td>
</tr>
<tr>
<td>symmetric composition</td>
<td>—</td>
</tr>
<tr>
<td>spatial depth</td>
<td>—</td>
</tr>
<tr>
<td>realistic</td>
<td>—</td>
</tr>
<tr>
<td>multicolored</td>
<td>—</td>
</tr>
<tr>
<td>neat</td>
<td>—</td>
</tr>
</tbody>
</table>

Table 5. Component score of Implicit Features Scale

<table>
<thead>
<tr>
<th>Implicit features</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>clear</td>
<td>—</td>
</tr>
<tr>
<td>clear</td>
<td>—</td>
</tr>
<tr>
<td>multicolored</td>
<td>—</td>
</tr>
<tr>
<td>complex</td>
<td>—</td>
</tr>
<tr>
<td>severe</td>
<td>—</td>
</tr>
<tr>
<td>arranged</td>
<td>—</td>
</tr>
<tr>
<td>dynamic</td>
<td>—</td>
</tr>
</tbody>
</table>

Table 6. Result of principal component analysis

<table>
<thead>
<tr>
<th>Amount of elements</th>
<th>Regularity</th>
<th>Complexity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization</td>
<td>0.73</td>
<td>0.17</td>
</tr>
<tr>
<td>Three-dimensional</td>
<td>-0.66</td>
<td>0.44</td>
</tr>
</tbody>
</table>

Arrangement of paintings based on the principal component scores are presented in Figure 1.

Figure 1. Order in Paintings

Regularity and Aesthetic Evaluation
First we examined the influence of Regularity on aesthetic evaluations. Figure 2 shows the results of the regression analysis. The association between regularity component scores and aesthetic evaluations scores fitted a quadratic function and regularity in paintings explained 79.8% of the variability in aesthetic evaluations (F (2,11) = 17.77, p < .01). The association between aesthetic evaluations scores and regularity displayed an inverse U-shape. Our results suggested that aesthetic evaluations scores were the highest when regularity in paintings was moderate. On the other hands, aesthetic evaluations scores were the lowest when regularity in paintings was extremely high or low.
Figure 2. Regularity and Aesthetic evaluations

Complexity and Aesthetic Evaluation
We also examined the effect of complexity on aesthetic evaluation. Figure 3 shows the results of a regression analysis, which indicated that the best fit of the relationship between complexity component scores and aesthetic evaluations scores was to a quadratic function, although it was not significant. This suggested that 15.5% of the variability in aesthetic evaluation could not be explained by the complexity in paintings. These results suggest that complexity was not associated with aesthetic evaluation. This could be due to the multidimensionality of complexity and it is possible that different types of complexity influence aesthetic evaluations in different ways.

Figure 3. Complexity and Aesthetic evaluations

Formula for Predicting Aesthetic Evaluation of Paintings
Figure 4 shows the results of Multiple Regression Analysis with the sum of the square of the principal component scores of regularity and the square of the principal component scores of complexity as an explanatory variable, and aesthetic evaluations scores as an objective variable. The model accounted for 76% of the variance in aesthetic evaluation. The association between aesthetic evaluation scores and order showed an inverse U-shape, with aesthetic evaluation being the highest when order in paintings was moderate. These results indicated that order in paintings affected its aesthetic evaluation. In other words, participants awarded higher aesthetic evaluation ratings to moderate order in paintings than to low order.

The predictive equation calculated for aesthetic evaluation of paintings \( y \) was: \( y = 5.03 - [0.22 \times (\text{regularity principal component score})^2 + 0.08 \times (\text{complexity principal component score})^2] \).

Figure 4. Prediction formula

Discussion
Regularity and Aesthetic Evaluation
The association between order in paintings and aesthetic evaluation of those paintings was examined, which exhibited an inverse U-shape. This result suggests that aesthetic evaluation increases linearly when the regularity in painting was moderate. However, further increases in regularity reduced aesthetic evaluation. The framework described by Berlyne (1790) can be used to explain this result. Berlyne examined the relationship between beauty and visual complexity using art and music stimuli and also reported that the association between preferences and interest in visual complexity exhibited an inverse U-shape. When an object has low complexity, preference was low. In other words, people highly evaluate moderately complex stimuli.

Order in paintings examined in this study indicated that paintings were highly evaluated when they had a moderate degree of order. Works of art such as paintings are made to be appreciated. Paintings with too much regularity seem to be
less interesting as visual objects, whereas paintings with too little regularity do not seem to give an impression of aesthetic quality, and as a result are evaluated less highly.

Complexity and Aesthetic Evaluations
Complexity in paintings was not associated with aesthetic evaluation, possible because of the multidimensional nature of complexity. A recent study by Nadal, Munar, Marty, and Cela-conde (2010) proposes that complexity has many dimensions. Results of examining the structural complexity of digitalized images, such as abstract artistic, abstract non-artistic, representational artistic and representational non-artistic images indicated three dimensions: Elements, Disorganization and Asymmetry. Moreover, each of these types of complexity differently influenced the evaluation of beauty. The relationship between Elements and the beauty score fitted a cubic function, whereas the relationship between Disorganization and the beauty score fitted a quadratic function and there was no relationship between Asymmetry and the beauty score.

Beauty of stimuli seems to have different relationships to different dimensions of complexity. It is suggested that complexity was just one axis, and the relationship between complexity and aesthetic evaluation was been demonstrated in this study.

Order in Paintings and Aesthetic Evaluations
Multiple regression analysis was conducted using the squares of each principal component score as explanatory variables. Aesthetic evaluations were explained by regularity and complexity. The results suggested that aesthetic evaluations increased linearly with regularity when a painting was moderately complex. Moreover, further increases in regularity and complexity reduced aesthetic evaluation.

The predictive equation calculated for the aesthetic evaluation of paintings (y) was: \( y = 5.03 - [0.22 \times \text{regularity principal component score}]^2 + 0.08 \times \text{complexity principal component score}^2 \). The association between aesthetic evaluation scores and order indicated an inverse U-shape, with aesthetic evaluations being the highest when order in paintings was moderate. These results indicate that order in paintings affects the aesthetic evaluation regarding paintings.

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The Structure of Subjective Indeterminateness in Aesthetic Responses to Film

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Abstract
The temporal dynamics of aesthetic responses is indispensable in understanding the underlying cognitive-affective processes. Previous work has emphasized the role of anticipation in processing uncertainty in the psychological experience of several art media. The present study set out to elucidate the cognitive structure of resolving subjective indeterminateness in narrative art. In a within-subjects design, the study consists in ten adult fluent English speakers presented with 4 film clips, with 2 successive narrative events/ clips in each film. At the end of each stimulus presentation, participants provided ratings on: the size of resolution alternatives, their likelihood and likelihood loading, and the extent to which each scene is subjectively ambiguous overall. A stepwise linear regression model was run on these predictors to account for subjective ambivalence. This first exploration established a significant role for the number of alternatives generated by participants in relation to one central character in the film segments.

Keywords: emotion, empirical aesthetics, film.

Introduction
Anticipation is a quintessential ingredient in artistic engagement. Aesthetic experiences have long been associated with complexity, familiarity, novelty and uncertainty (Berlyne, 1971), and are thought to arise from expectations through a sequence of prediction, subcortical affective reaction and appraisal reactions (Huron, 2006). Emotion may inevitably be linked to dealing with unpredictedness (Simon, 1967), throughout a multitude of appraisal potential and action readiness modification processes (Frijda, 2007). The way in which we process the uncertainty of emotions in art pieces remains to be understood.

We propose that the resolution of subjective indeterminateness among concomitant alternatives may play an important role in the temporal dynamics of emotion perception. Cognitive empathy – the knowing of others’ internal states, empathic accuracy (Ickes et al., 1990), and affective theory of mind (Shamay-Tsoory et al., 2004) may encompass this phenomenon of ambivalence throughout various levels of processing or schools of thought. If mental state attribution is similar to postulating a theory (Gopnik and Meltzoff, 1998), then ambiguity elucidation may augment other cognitive components of explanation, reasoning and behaviour prediction. Mirroring with one’s own resonant states may otherwise lead to knowledge of others’ affective states (Gallese and Goldman, 1999). However, distinct physiological states may be simulated based on sequentially perceived, yet discrepant environmental cues and it remains unknown how coherence in emotion perception arises among these, if at all.

Narrative art most fruitfully capitalizes on the psychological workings that make for affect fluctuations in human interactions. Several cognitive processes that are used when participating in everyday life are paralleled in experiencing fictional narratives (Gerrig, 1998). Narratives may then shed light on the elemental components of processes that resolve uncertainties about emotions. Reading fiction has been associated with self-reported empathy (Djikić et al., 2013), and empathy is significantly related to cognitive flexibility in certain prefrontal cortex sub-regions (Grattan et al., 1994).

The present study set out to elucidate the structure of resolving subjective indeterminateness in narrative art, with a particular focus on the role of processing concomitant emotion alternatives.

Methods
Stimuli
In a within-subjects design, participants were recruited the study consists in 10 adult fluent English speakers with normal hearing and sight presented with 4 film clips, each lasting between 2 and 5 minutes. The film clips contain English-language speech and were extracted from fiction films. The segments were selected to represent two narrative events per film, each reflecting uncertainty with respect to the emotions and future behavior of a character in the narrative. Aside from de-combing and de-interlacing being applied according to video quality need, the mp4 video characteristics were standardized via Handbrake and web optimized by using an H.264 codec at 2500 kbps for all films, resolution and constant frame rate true to the source, with cropping added to eliminate superfluous black borders and an AAC audio codec rendering stereo output with a bitrate of 160 kbps.

Procedure
The experiment was run on a Qualtrics online platform, in accordance to Queen Mary University of London ethics standards. After a practice session, the two films were
presented in a random order, each of the 4 videos being played without pause following an instruction about who the person of interest is in the film. After each video, participants completed an item that verified the video had been watched and then gave ratings about the major emotion dilemmas at the respective narrative development point. The items measured: the set size of emotion alternatives (n); a list of all alternatives considered during the watching time (a); a likelihood estimate for each (p); the likelihood overlap, or compatibility (o); the extent to which they experienced ambivalence, overall, during the scene (a), the proportion of time they considered each alternative (t) and, finally, liking (l), and familiarity (f) scores, as well as several subsections of the Goldsmiths Musical Sophistication Index (GMSI) (Müllensiefen et al., 2011), adapted for art.

Results
In order to explore the relative contribution of the several factors on subjective emotion ambiguity, we coded the number of alternative by counting the generated emotions, the standard deviation of the likelihood estimates and the overlap extent weighted by the number of items provided in each overlap grouping. A stepwise multiple linear regression was run in Matlab R2014a to explore the relationship between subjective ambivalence and the three main predictors. The final model retained the intercept (est=2.34; SE=0.55, p=0.0001) and the number of alternatives (est = 0.20; SE= 0.09, p=0.027; adjusted R-square=0.099).

Discussion
Performance-based tape-stop measures have reliably been used to study empathic accuracy (cf. Ickes, 2003). In the present study, we aimed to investigate the structure of ambivalence-based subjective indeterminateness, by using sequential event pairs in narrative art. The number of emotion alternatives generated for characters in film segments accounts for a significant portion of the variance in subjective ambiguity. Future analyses are to take into account, in a larger sample, across several films events, and across self-report and behavioral tasks, the change of subjective ambivalence across sequential film events, intra-subject variability, as well as the impact of familiarity, liking, and the GMSI.

Such models are to establish the structure of active meaning generation processes to explain the changes that arise throughout our experience with narrative art. These may become the basis for future film annotation initiatives.

References
Development of Creativity for the E-Learning Training of Teachers

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Abstract
This study aimed to assess the teachers’ specific didactic, evaluation and relational competences after e-learning degree courses compared to those who had not had any university training.

To survey these effects, we prepared a specific tool, the CDVR Questionnaire. Participants of the experimental group (n=287), composed of teachers who had graduated in Education Sciences in e-learning mode, showed an increase in their didactic-evaluation competences, greater relational skills, increased confidence in their own professionalism and an enhanced perception of the growth in their own professional skills, compared to the control group (n=88) who had not had any in-service training. The e-learning degree course, geared to promoting specific methodological, didactic and psychological knowledge concerning educational processes and learning dynamics, in turn also produced a change in teachers’ relational styles by developing a perception of the ability to understand others and a mental flexibility, that is, creativity.

Keywords: Competence, Creativity, E-learning, Empathy, Teacher.

1. Introduction

This contribution lies within the complex theme of the identification, surveying and analysis of teachers’ professional competences. It presents an experimental research project conducted in 2012-2013 by Domenici, Biasi and Ciraci for the Department of Education of “Roma Tre” University. The project involved all teachers in service in primary schools of the Lazio region and who had graduated in Education Sciences, conducted in e-learning mode at the same university. The study aimed to evaluate professional competences developed by E-Learning Training of Teachers. To survey these effects, we prepared a specific tool, the CDVR (Competenze Didattico-Valutative e Relazionali) Questionnaire, in order to assess the teachers’ specific didactic, evaluation and relational competences.

The e-learning degree course, geared to promoting specific methodological, didactic and psychological knowledge concerning educational processes and learning dynamics, in turn also produced a change in teachers’ relational styles by developing a perception of the ability to understand others and a mental flexibility, that is, creativity. This knowledge is acquired through active didactic modalities which, thanks to technologies, do not merely deliver content, but aim to apply knowledge in real or simulated contexts in order to find suitable solutions to problems. In our view, this promotes the development of attitudes underlying the “professional competences” of the expert teacher capable of being mentally flexible and thus creative in finding original solutions to the many educational problems faced. Creative thinking is indeed characterized by the ability to find many different solutions to problems that envisage several solutions, and is a resource in problem-solving strategies.

The research project lies within the broader PRIN 2010-2011 research program of national interest coordinated by G. Domenici and is still in progress. Its main aim is to experiment a flexible modular didactic strategy which, from primary school to entering employment, can make a contribution to timely remove obstacles, valorize diversity, combat social exclusion and promote educational achievement in students.

2. Creative Thinking and Teacher Training

2.1. Creative Thinking in Psychological Research
Psychological research into creativity has been on the increase, as witnessed by a broad series of classical and recent contributions, including those which are able to offer useful summaries and recapitulations of the studies carried out (Torrance, 1966; Guilford, 1967; Runcorn & Albert, 1990; Csikszentmihalyi, 1997; Sternberg, 1999; Andreani Dentici, 2001; Legrenzi, 2005). The studies have taken many paths, among which there is also the dynamic approach, which quite rightly takes its place among the various study methods. While there are theoretical contributions and those of systematic observations focusing on the role of certain personality traits (Eysenck, 1993; Simonton, 1997), interesting contributions are also provided by recording and analysing short-term dynamics, such as the ones triggered by certain environmental conditions, activities carried out, instructions and prescriptions, as well as goals and contingencies. These dynamics may in turn present different effects according to personality (Hinton, 1971, Leith, 1972; Falat, 2000), but they may also have a more general validity, as we shall see in the present work.
On the basis of the data obtained through various experimental tests, Bonaiuto, Biasi, Giannini, Bonaiuto, & Bartoli (1992) and Biasi & Bonaiuto (2004, 2011) have been able to develop a general theoretical model on stress and comfort dynamics. According to this psychodynamic model, stress implies an overloading of conflict with an increase of its emotional, motivational and cognitive consequences. Within certain limits, in order to avoid and/or reduce unpleasant features of such an affective activation, people may reject other kinds of conflict, among which there are cognitive incongruities and uncertainties. Comfort and relaxation act in a rather opposite way. Other affective processes may interfere, especially defence mechanisms.

In agreement with the dynamic literature and with important trends in general psychology, psychological conflict is a primary mechanism in stress situations. Going into detail, experimental demonstrations suggest that living in a state of stress leads to an increase in emotional and cognitive conflict. As a result, this fact favours an increase in anxiety, anger, sadness, shame, embarrassment, guilt, pain and other “negative” emotions, as well as aggression, desire for body movement and the need for cognitive congruence. There is also an increase in feelings of threat and insecurity, inferiority and self-insufficiency.

An excess of conflict favours intolerance of incongruity, uncertainty and ambiguity – since facing strongly incongruous, uncertain and/or ambiguous elements means facing additional conflicts. Again, we admit that an increase in causality attribution easily plays a role in reducing or avoiding incongruity, since a cause/effect relation means the explanation of phenomena that would otherwise be incomprehensible.

Moreover, we showed the short-term effect in the field of creativity, in the sense of its prevalent inhibition and stereotyping: because creativity (by definition) has to do with the acceptance of new ideas, even incongruous ones, strange, unusual and bizarre configurations that challenge and contradict the previous consolidated mental schemata (Biasi & Bonaiuto, 2004, 2007).

This experimental evidence coming from general psychology can represent a theoretical basis for applications on educational issues: we underline the relevance of the development of creativity for the e-learning training of teachers, in order to enlarge the possibility of problem solving strategies in education.

2.2. The “reflexive turning-point” in education: teachers’ competencies and creativity in teaching-learning processes

For many years now, the international literature (Argyris & Schöon, 1978; Schöon, 1983; Parker, 1997; Ghaye, 1998; Korthagen, 2001; Mortari, 2003; Clarke & Chambers, 2004) has stressed, and especially tried to investigate, the creative aspects in teachers’ competencies. Dewey had already described the reflexive process as a fundamental function of the mind stimulated by “cognitive discomfort”, a state of uncertainty or perplexity calling for a retrospective examination of the situation and overcoming doubt through new decisions (Dewey, 1933). It is getting over this sense of disorientation and limiting the uncertainty that represents the biological function of so-called creativity according to Garroni (2010), one of the most original and significant philosophers of the twentieth century. For Garrone, the term “creativity” has meaning only when correlated with the way our species adapts to the environment, and thus to the way it performs the set of operational and cognitive tasks which guarantee its survival. According to Garrone, in the wake of a long philosophical, theological and juridical tradition, creativity is an adaptive procedure determined by necessity and characterized by the elaboration of original, not pre-established, solutions. Creativity is identified with the propensity to specify general laws and principles. It is thus encapsulated in the way we apply a general rule in a particular case, or specify a natural law with reference to certain contingent phenomena, or use an intellectual principle of universal scope in an unrepeatable occasion.

This is the idea of creativity that we find in the new epistemology of professional practice summarized in the proposal of the “reflexive professional” (Schöon, 1983; Mezirow, 1991). It is an approach that tries to understand how professionals deal with situations that are impossible to solve only in technical terms, such as teaching, characterized by the need to act in uncertain peculiar situations which involve conflicts of value. This process constitutes, as Schöon calls it, a “reflection in the course of action”, or the creative component of the professionals of the future.

Teaching often means “acting in urgency, deciding in uncertainty” and the exercising of professional competence occurs through complex mental operations based on thought patterns (Perrenoud, 1996). As demonstrated in a great deal of international literature, for professional teachers it is essential not so much to possess a certain repertoire of techniques and pre-codified lines of action, but to develop the capacity to grasp the original profile of situations and putting into play that “diagnostic capacity” enabling one to “feel” factual situations, in order to differentiate and modify them.

If the professional teacher must be an expert teacher able to reflect on his/her own practices to find novel appropriate strategies to solve problem situations in his/her routine work, then one must bring out expertise, intuitions or “artistic abilities” – the expression of the fusion of theory and practice – that professionals can put into effect in situations of uncertainty, uniqueness and conflict of value that arise daily. Developing and valorizing these competencies in teachers, turning them into an essential professional habit in order to face the dynamic nature of knowledge and contexts means, however, going well beyond mere experience. Experience alone is not enough. It is necessary re-elaborate and to reflect on it: to enable knowledge of practice to turn into thought and conscious professionalism we need to arrive at a specification of the meaning of an experience, at its reinterpretation, in order to turn it into intentional learning (Mezirow, 1991). Active didactic modalities thus become necessary: in order to apply knowledge in specific, real or
simulated, contexts to find suitable solutions for problems, they can promote the development of attitudes underlying the expert teacher’s “professional competencies”.

In particular, in online didactics that is not limited to a mere transmission of contents, the new technologies – if suitably located and integrated – enable the “conquest of higher levels of reflection (the capacity to see problems from many angles...)” (Calvani, 2000).

And this is the perspective characterizing the didactic approach of the degree course in Education Sciences in Distance Learning Mode on the e-learning platform of Roma Tre University. The course was created for teacher training and its didactic methods, thanks also to the potential of the network, are based – more than just on the transmission of pre-established knowledge – on proposals of activities that are real simulations of events situated in teaching contexts. The course is also based on evaluation and self-evaluation tools focusing on processes as much as on results – on how one learns as well as on what one learns, and, by facilitating experiential learning, it enables the development of the awareness of one’s cognitive processes and the capacity to implement problem-solving strategies (Domenici, 2009; Ciraci, 2009).

3. An empirical study to assess teachers’ didactic, evaluation and relational competencies with a view to developing creativity in teaching processes

3.1. Hypothesis, Methodology, Participants

The university teacher-training e-learning course presented here particularly aims to promote specific methodological, didactic and psychological knowledge concerning educational processes and the dynamics of learning. As such, we expect it to strengthen an empathic attitude in the teacher, and also to develop greater creative problem-solving skills or mental flexibility, thanks to the fact that a better knowledge of the learner’s psychology and of the various didactic and evaluation strategies will provide greater resources to modulate the educational style and facilitate learning.

We intend to assess these changes by evaluating the teachers’ didactic and relational competencies, developed thanks to the aforesaid university training course, with a specific tool: the CDVR. The study involved setting up an experimental group consisting of 287 teachers in service in primary schools of the Lazio region and who had graduated in Education Sciences by means of the e-learning degree course (the participants, mostly women, matriculated starting from academic year 2004-2005 and graduated by January 2012; with a mean age at the time of matriculation of about 45 years); and a control group of 88 teachers, with the same characteristics of age and gender, in service in primary schools of the Lazio region who did not take a degree; the teachers came from 5 primary schools (20 teachers from each) of the Lazio region.

The comparison of the experimental group with this first control group enabled us to check the discriminant validity of the tool.

During the analysis, a comparison was made with a second control group consisting of graduates who are not school teachers: they did the same degree course in Education Sciences, but in the classic face-to-face mode and not through e-learning.

3.2. Tool and indicators. The CDVR questionnaire for assessing the teachers’ didactic, evaluation and relational competencies

If “competencies” are expressed in the “capacity to adopt structures, plans and programmes of action capable of integrating the formal, informal, theoretical, experiential and procedural knowledge possessed in order to solve a problem in a specific environmental context; to also adopt a monitoring system for the validity of the programme in the specific context (meta-cognition), and hence to readapt it (meta-evaluation and meta-decision) constructively to implement suitable behaviors for reaching the goals, or for reaching an adequate result for the established intentions” (Domenici, 2000; 2005), if what produces “competence” is the capacity to apply knowledge, to make it productive, then this capacity should be learnt along with the knowledge itself. It is known that the transfer of knowledge is not always automatic, but is often the fruit of “work”, of a pedagogical and didactic task, without which nothing happens, except for students who possess great personal resources. A competence stabilizes when the mobilization of knowledge activates established patterns, because it is these schemas that enable us to mobilize knowledge, methods, information and rules to deal with a situation (Piaget, 1974). And schemas are constructed on the basis of constant practice or training (Perrenoud, 1996, 2000), and they are shaped by the experiences, needs and motivations of the subject who perceives and learns (Biasi, Chiappetta Cajola and Bonaiuto, 2010). It is thus a matter of constantly and systematically using evaluation and self-evaluation tools in education processes. These tools must focus as much on processes as on results, on how one learns as well as on what one learns.

“Learning to learn”, which represents the educational paradigm of current complex knowledge societies, actually involves not just the possession of specific knowledge, but also how to manage one’s learning processes. The difficult task of identifying teachers’ general and specific competencies must entail theoretical and political-cultural options. Teachers’ competencies must thus be defined within an explicit and structured professional profile in terms of what an individual must know and must know how to do in order to be a “good teacher” in the school of autonomy (Ciraci, 2012, 2013).

The CDVR tool for assessing the teachers’ professional competencies that we used was devised by taking into account certain internationally acknowledged theoretical orientations, of which we report some references here:

I. The first stems from the proposal emerging from the
OECD-Ceri studies (1994, 1998), according to which the competencies distinguishing the "good teacher" are fundamentally: methodological-didactic competencies (including evaluation ones); disciplinary competencies; communication and relational skills; organizational skills (also concerning all those activities outside the classroom); "reflexivity", that is, the capacity to critically reflect on one's own professional practice. II. The second consists of welcoming the idea of a new epistemology of professional practice, summarized in the proposal of the practitioner or "reflexive professional" (Schön, 1983) who highlights the components of creativity and mastery necessary for professional practice. It is an approach which tries to understand how professionals deal with situations that are impossible to solve solely in technical terms, such as teaching, characterized by the need to act in uncertain and peculiar situations, and where there are conflicts of value. III. The third, underlined in the Communiqué of the European Commission to the European Parliament and European Council, Improving the quality of teacher training, of 3 August 2007, concerns the teachers' need to work with the most modern technologies, to be able to guide learners in networks in which one can find and produce information (European Commission, 2007). Information and Communication Technology (ICT) can make an important contribution to our education system's shift from knowledge-based teaching to a skills-based approach, and e-learning can be a great boost to the renovation of education practices. IV. The fourth refers to the official definition of competence contained in the European Parliament and Council Recommendation of 23 April 2008 on the construction of the European framework of qualifications for lifelong learning, which considers competence as the “proven capacity to use knowledge, skills and personal, social and/or methodological abilities in work or study situations and in professional and personal development” (European Parliament and European Council, 2008).

The questionnaire thus consists of both closed and open questions relating to various thematic sections or spheres: ascriptive data and working position; didactic strategies; evaluation strategies; use of technologies; perceived self-efficacy; educational and relational style.

3.3. Results

The data were processed to assess differences between the average values applied to two percentages of two different samples. We used a parametric test which analyzes the standardized difference variable of the percentages. This is distributed as a “Z” variable for which, for external values higher than the confidence limit considered acceptable (-1.96 + 1.96), we presume that the difference found is such to hypothesize that the two percentages come from samples of different populations. We must stress that in analyzing the various so-called “full” items, that is, those without any filters, we note that the number of respondents decreases slightly, but their number is still below or around 5%, even if they sometimes reach peaks of over 10%. This makes the results reliable.

In summary, the experimental group (the teachers who had graduated in Education Sciences in e-learning mode) had significant qualitative and quantitative results with regard to an increase in their perception of the didactic-evaluation competencies possessed (a high increase in 85.0% of the cases for evaluation competencies, and in 75.3% of the cases for methodological-didactic competencies). The innovative aspect of the present study consists of finding a greater relational capacity after their university course – a perceived change in their own relational style after doing Psychology (maximum intensity perceived of the change: 8 points for 22.9% of the teachers of the experimental group), in Didactics (maximum intensity perceived of the change: 8 points for 29.7% of the teachers of the experimental group) and in Docimology (maximum intensity perceived of the change: 7 points for 27.0% of the teachers of the experimental group). This important effect of the three-year university course concerns the change found in the relational style adopted, in particular, for the following indicators – which show an evident dissimilarity with the hypothesis of an equidistribution – from which we deduce (see Figs. 1-3):

- Lower impulsiveness (most of the teachers said they reacted little or not at all emotionally compared to before).
- Less insecurity, ascertained from the fact that teachers seek social recognition for their activities less.
- Greater decision-making ability, that is, being less uncertain when taking decisions than before.
- Greater determination, expressed in the ability to complete tasks, to find the reasons for difficulties encountered in one’s profession, to deal with forms of anxiety, to connect knowledge already possessed to new knowledge.
- Greater professional responsibility in the sense of attributing success or failure to one’s own personal commitment more, and thus a growth in the so-called internal locus of control which enables developing a positive and constructive attitude in the face of professional difficulties, and generally reduces the perception of powerlessness and stress.
- The development, over the three-year course, of a more empathetic attitude (greater attention to others’ needs) and pro-social attitude (“I try to help others”) probably also linked to the fact of having greater resources to deal with the various problems in one’s job.

The aforesaid university teacher training course in e-learning mode is geared to promoting specific methodological, didactic and psychological knowledge, and it in turn produced a change in the relational style adopted by developing the teachers’ perception of the capacity to understand others (empathic sensitivity, emotional intelligence) and mental flexibility, that is, creativity, probably also linked to the perception of having greater resources to face the various problems in the profession.
In our view, the knowledge gained – through active didactic modalities, thanks to the self-evaluation technologies and procedures (with context simulations) – is not limited to mere transmission of contents, but aims to apply knowledge in real or simulated contexts in order to find adequate solutions to problems. It encourages the development of attitudes underlying the “professional competencies” of the expert teacher, who is capable of being mentally flexible and thus creative in finding original solutions to the great many educational problems encountered.

In summary, we underline not just how the increase in didactic, evaluation and relational competencies after the three-year university training course had produced specific knowledge of new methodological and didactic strategies and specific psychological contents concerning education processes and the dynamics of learning, but also how this knowledge had in turn promoted a change in the way the teachers related to learners and colleagues, respecting their inter-individual differences, and thus a change in the quality of the educational relation.

4. Comments and Conclusions

A better understanding of who we are dealing with, and better communication with them (thanks to enhanced didactic-evaluation strategies and a deeper understanding of psychological principles), leads to a special effect on the capacity to interact and to develop a positive attitude within the educational relation. This attitude leads to an enhancement of motivational and learning processes, and thus to the achievement of the educational outcomes pursued. This change in attitude is based on strengthening empathic capacity, emotional intelligence and, particularly, the development of mental flexibility, or creativity, in order to cope with frustrations (see Hinton, 1991; Falat, 2000; Shahenn, 2010).

It provides the teacher with greater resources to deal with the various problems in the profession and thus to avoid a rigid and defensive type of attitude. The development of these competencies reduces the feeling of powerlessness and stress to the advantage of a receptive and flexible attitude geared to problem-solving.

References


The article is the result of the joint work of the three authors, Gaetano Domenici wrote paragraphs 1, 3.1, 4; Valeria Biasi the paragraphs 2.1, 3.3; Anna Maria Ciraci the paragraphs 2.2, 3.2.
Neuro-aesthetic Outlines of the Post-postmodernism:
Between Sciences and Humanities in I. McEwan’s “Saturday”

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Abstract
Saturday portrays new forms of time and space and their perception by a human being. It demonstrates new understanding of the issue which can be theoretically marked as “a mental being in time and space.” For McEwan, it is highly important to analyze the inner forms of the human consciousness which is portrayed as a natural phenomenon with physical limitations and which exists according to the physical rules. Henry Perowne’s discourse reveals a philosophical and also a medical discussion about the nature of consciousness — whether it can be described as a ghost in the machine or as a net created by the human neuroactivity, or as an independent phenomenon which controls human emotions (psyche).

Keywords: I. MacEwan, Saturday, neuroaesthetics, post-postmodernism, contemporary British novel.

End of the Postmodernism
The authors of this paper would like to focus on the fact that one of the recent issues of the American magazine Adbusters (No 88) discusses the post-postmodernism situation analyzing it from political, social, and cultural modes. The issue is opened with rhetoric narration, ‘The current rupture moment has captured us. We are thoroughly jaded by the dreams of “progress” associated with modernity and capitalism, but unable to venture in another direction. Can we confront this situation? Can we be the ones that “we” have been waiting for?’1 After this, in this magazine, we have a set of similar questions like these: ‘Is postmodernity slipping into something new?’, etc.

In 2009, an interdisciplinary conference ‘Writing History after Postmodernism’ took place in Stuttgart, Germany that was aimed
‘to suggest methods for overcoming the uncertainties of the post-postmodernist academic environment.’

But Nottingham Trent University sociologist Mike Featherstone quotes a newspaper announcing (sic!” what?”) in August 1977 that ”postmodernism is dead” and that ”post-postmodernism is now the thing”. Two years before Jean-François Lyotard said that he took postmodern to mean an ”incredulity toward metanarratives” and gave Generation X its cogito ergo sum; four years before Jean Baudrillard unveiled the ”precession of simulacra” and lent Keanu Reeves somewhere to hide his computer disks; and seven years before Fredric Jameson crowned postmodernism the ”cultural dominant” of our time, the emperor of our arts, thought, politics, society and ethics. In fact, postmodernism has been declared dead for as long as it has been alive.2

Post-postmodernism forces us to have not only cultural but also political transformations. Besides, the centre of the post-postmodern identity is humanity with its true feelings (besides, now we call this trans-sensuality) and not the sociopathic virtual identity that escaped from the ‘true’ world with its cognitive, political, social, economical problems. Post-postmodernism underlines that these days we need to form traditional human relations based on understanding and empathy with the help of technological innovations and applications.

Raoul Eshelman (Ludwig-Maximilians-Universitat in Munich) sees contemporary culture through the lens of performatism, a theory rooted in Eric Gans’ generative anthropology and the philosophy of monism. Like digimodernism, performatism is an interdisciplinary paradigm, although Eshelman focuses more on ‘old’ media. In this way,

performatist texts such as Yann Martel's 2001 novel Life of Pi, Sam Mendes’ film American Beauty (1999) and the architecture of post-reunification Berlin frame their reader so that s/he accepts for their duration a set of values and practices that postmodernism treated with

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2 Kirby A. Successor states to an empire in free fall. 27 May 2010 // www.timeshighereducation.co.uk/story.asp?storycode=411731
notorious suspicion, such as identity, transcendence, love, belief and sacrifice. They "bring back beauty, good, wholeness and a whole slew of other metaphysical propositions, but only under very special, singular conditions that a text forces us to accept on its own terms". Tempered by postmodernism's skepticism, performance (non existing word here) steps beyond it and into a distinctively new artistic era.  

Post-postmodernism can be easily and scholastically described if we turn to literature. For instance, the writings of Ian McEwan, Haruki Murakami, Roberto Bolaño or David Lodge, as they are each typified by a continuous oscillation, of constant repositioning between attitudes and mindset that are evocative of the ‘modern and of the postmodern but are ultimately suggestive of another sensibility that is neither of them; one that negotiates between a yearning for universal truths and relativism, between a desire for sense and a doubt about the sense of it all, between hope and melancholy, sincerity and irony, knowingness and naivety, construction and deconstruction.  

In the post-postmodern period, we have a true human emotional feeling (not a trans-personal ‘recitation’ of someone else’s feeling) based on deep empathy and the presupposition of ‘I’. A hero of the post-postmodernism gets back his or her ‘first position’ and emotionality. However, in the post-postmodernism, the understanding of global world is a serious problem as well as understanding human motivations and their nature.  

I would like to focus on the thesis that this transformation of the postmodernism into post-postmodernism can be traced in the contemporary world cinema in which we find new themes, new motifs and new heroes who represent the mentality of the post-postmodern period (to some extent the notion “metamodernism” suits the epistemological specification of our times.) We mean that the post-postmodern culture exist as a multifaceted network of new tendencies. Speaking more generally, we can name the tendency which was deeply analyzed by the Spanish culture studies experts. This tendency received the name “carnelhísmo” (carne in Spanish is meat) and it represents the new forms of aesthetics oriented to appall, to thrill and to astonish the recipients. Let me remind you the boom connected with the film “Saw”. It is a bright example of the new aesthetics based on the desire to shock the views, to provoke the strong emotional response to the represented content. This content is based on the human body as a “meat,” the body can pass through different tortures. Moreover, this motif is represented with all its naturalistic hyperbolic outlining. This tendency in the contemporary culture can be explained as a response to the postmodern mentality based on the principles of cognitive/emotional tranquility when the subject/ doer exists in the reality with no relations to the real world. The postmodern hero often exists in a virtual world and he or she does not care about the real life. The new culture provides non-aesthetic forms of communication to its recipients. Or perhaps these new forms are “non-aesthetic” from the point of view generated by the traditional cultural paradigm.  

Postmodernism did not equate aesthetic value with beauty. What “Lyotard suggests instead, is an aesthetic of the sublime. Lyotard views the sublime as being a mixture of pleasure and pain, of pathos and grit, of sweetness and sin, of the cute and of the dirt. It's aim, Lyotard claims, is to "present the unrepresentable" to find religion in the streets not in the Church. This aesthetic of the sublime, which transcends moral categories like "that feeling is good, that feeling is bad, that smells good, that smells bad, that looks nice, that looks bad," epitomizes the de-differentation which marks postmodernism, which in the words of John Cage, "aims to wake up to the very life we're living" and which in the words of Leslie Fiedler, "attempts to cross the border, close the gap." This means, explains Marshall Berman, breaking down the barriers between art and other human activities, such as commercial entertainment, industrial technology, fashion and design, and politics.  

I must admit that the sublime as an object has been known since antiquity. The approach to the "sublime object may involve a gradual buildup of expectations that is akin to development in 19th-century musical compositions, except that it may be spread over hours, days, or much longer periods. There is typically also an increase in thoughts and activities that contribute to the eventual state of aesthetic awe. In the final stage of the approach, even though one may factually know that the sublime is “lust around the comer,” there is the shock, the “Wow!,” when it is suddenly revealed, or revealed in fall.  

From the traditional culture studies we know about three related states — aesthetic awe, being moved or touched, and thrills or chills. Aesthetic awe is regarded as the ultimate humanistic moment, the prototypical aesthetic response to a sublime stimulus, and one that has been sexually selected. The sublime is pan-cultural and encompasses great beauty, rarity, and physical grandeur (for music to become sublime, it requires a “colossal” performance setting). Aesthetic awe is a primordial mixture of joy and fear, which like joy, requires existential safety. It is virtually indistinguishable from the fundamental emotions, yet one that can be more easily “switched off,” because the sublime is nonsocial and non-interactive. Aesthetic awe is always accompanied by the responses of being touched and (physiological) chills, but the latter two can also occur in awe’s absence. To be moved further, a personal associative context is needed; memories, love, or a victory’ over mortality fears may play a part. Thrills are the most common aesthetic response, one that can occur without the others.  

6 Ibid. — P. 32.
However, the postmodern era made some major transformations in the understanding of the three states mentioned in the previous passage of my paper. The postmodernism tried to neglect the true essential human emotions and deep emotional response to the natural/human phenomena. The followers of structuralisms and post-structuralism proclaimed the illusion of “big narratives” which also resulted in the destruction (or deconstruction) of such notions as “big human emotions’ (as love, patience, courage, compassion, etc.) and “big human expectation.” The “big” works of art which were defined as over-time lusting cultural masterpieces in the postmodern mind were neglected and, what is more, banned, ironically transformed and ironically destroyed.

In the postmodern mind, there was a doubt that human beings can respond “powerfully and profoundly to great works of art, to extraordinary man-made objects, and to rare wonders of nature. That responds if they had place were described as simulacra with no true emotional ground. In the traditional cultural paradigm we are supposed to believe that such stimuli (that we call “great works of art”), as well as the various components of the occasions of one’s exposure to them (including, especially, one’s resulting subjective state), leave deep impressions and are highly memorable: People include them in lists of their peak life experiences. It would seem that such an aesthetic phenomenon, perhaps the ultimate humanistic moment, deserves serious inquiry, if not a central place, in a mature psychological aesthetics. The postmodern aesthetics destroyed the understanding of “traditional; beauty” primarily based on the deep human emotions (which were called the “imitational”).

In the traditional realm of aesthetics, the sublime has been discussed (from Kant to Lyotard) as an object (or its attributes) external to the experiencing person and as the subjective internally felt consequence of one’s exposure to a relevant stimulus array. Let me define the sublime as both external to the subject and the ultimate aesthetic stimulus — a term which emphasizes that the context (especially spatial) is often an essential feature of a sublime stimulus. According to all major commentators, the sublime always includes but is not limited to exceptional, universally acknowledged beauty. However, the beautiful comparatively rarely includes or contains the sublime. Without wishing to enter a laborious and mostly irrelevant discussion about the definition, universality, and relativity of beauty-, the merely beautiful is here assumed to be far more common than the sublime, but also to be one of its obligatory components. The beautiful will be treated as the extreme high end of the dimension of aesthetic pleasantness, as an attribute that is located in nature, in human artifacts, and, especially, in the synergy of an artifact and its natural milieu.

I. Kant claims that the sublime can be “apprehended” only when the subject is “not in danger” - though one should add here “apprehended as aesthetically relevant.” In this view, whether or not there is an objective degree of danger in a stimulus and its context, the subject will respond to it as a sublime object (that is, aesthetically, which would include finding it beautiful), only if there is no subjectively judged physical threat. The notion of the sublime that involves an absence of physical threat is here extended to include a reasonable degree of existential comfort and security in the life of the potential experiencer (the subject which is “not in danger”). Let me remind the fact that the postmodern culture was to some extent a response to the modernism which historically related to the global world disasters as the I World War, the II World War, the period of Great Depression, etc. The postmodernism was a kind of opposition to the modernistic era when the basic epistemological binaries were revitalized. The postmodern hero has a desire to escape from the world based on the traumatic memory into the virtual world with no pain and traumas. In this way, we would like to stress the point that the postmodern minds in fact is potentially open to the aesthetic feeling but the aesthetic as itself can provoke some deep and strong emotions. And through these emotions the traumatic traces of the “memory of the past” can be resembled. The postmodern hero potentially exists in the same situation as the traditional mind which is ready to experience the aesthetic awe. But this awe will never happen in the postmodernism, and we consider this one of the most important peculiarities of the postmodern period.

In their research, Keltner and Haidt, analyze the etymology of awe and usefully point out that according to the Oxford English Dictionary the meaning changed from fear of a divine being to “dread mingled with veneration...” and, significantly, to “...the attitude of a mind subdued to profound reverence in the presence of supreme authority, moral greatness, or sublimity, or mysterious sacredness.” Keltner and Haidt do not pursue the notion of sublimity or of the sublime; they consider awe to be a “family” of emotions and in the very title of their paper mention awe as an “aesthetic” emotion (as well as a moral one). The scientists think of “primordial awe [as] center[ing] upon the emotional reaction of a subordinate to a powerful leader,” which would presumably make it closely related to one of the

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fundamental emotions, fear. The point of disagreement arises when Keltner and Haidt regard aesthetic awe as a culturally elaborated extension of the primordial version. The present view is that aesthetic awe is a response to the sublime that is as primordial as fear - and joy; in fact, it is assumed in this paper that it is composed of some elements experienced in both of these fundamental emotions. Whether the fact that it is a mixture makes aesthetic awe less fundamental than fear and joy is an open question.

In fact, postmodernism destroys the bridge from the state of “the existential comfort and security in life” to the aesthetic awe. However, this transformation is unnatural as existing in the situation of “no danger” the mind is structured for the meeting with the aesthetics (the beauty.) As a result, the post-postmodernism is oriented toward the creation of the aesthetical feeling but is needs a powerful emotional stress for this purpose. Aesthetic awe has presumably occurred from primeval times as a response, initially, to the unexpectedly encountered natural wonders, and later, to human artifacts also. As has already been implied, it involves a sense of suspense and of a controllable, interesting (as opposed to pleasing, in standard psycho-aesthetic terms) degree of risk. The post-postmodern culture is searching the effects close to that primitive states of suspect based on the natural wonder. However, the postmodernism transformed the human understanding of reality so much that only such phenomena as “carniehilismo” can modify the situation.

The postmodern situation has created a state of informational incapacity which resulted in the cognitive and aesthetical transformations and instability. The basic grounds of human ethical spheres have been modified during the postmodern era. Furthermore, the traditional understanding of morality, beauty (aesthetics), social relations, emotionality, etc have been changed.

To the contrary, the post-postmodern cultural challenges demonstrate the desire of their authors to shock the recipients, to destroy that feeling of ‘cultural insomnia’ and ‘tranquility’ of the postmodernism. However, the new findings in neurosciences and neuroaesthetics prove that the nature of the concept of humanity has not been changed. And the future of the humanity seems to be as the integrity of sciences and humanities.

The authors of the paper focus that the writers are often said to produce “metafiction” or “fiction about fiction”, i.e. self-referential fiction concerned with the possibilities, limitations and devices of writing. Therefore, they use a range of self-reflexive forms and intertextual reference. This is connected with the role of the author in his story. The writer is not firmly in control and never knows how the narration may develop. For postmodernist authors the “grand narrative” is totalizing and their work does not make claims on a meaningful representation of the reality. For this reason they frequently challenge not only established genres and literary forms but also the borders set by the society. Pastiche becomes a way of breaking established styles and rules. The employment of parody, paradox, language play and fragmentation further intensifies the experimental mode.

Bentley claims that the 1990s is a decade known for its “fascination with parody, pastiche, retroism <…> and its general scepticism towards grand narratives” (Bentley 2005: 4). These features can be traced in McEwan’s writing, however, in Saturday, we have something beyond this — which does not give the possibility to define the novel as postmodernistic only.

**Does Reality Exist? Medicalized Aesthetics**

Henry, the protagonist in Saturday, is appalled by the bonds between different situations, people or just objects in the ordinary life. He questions whether the ordinary is the essential element of the human perception of the natural phenomena. The day of Henry Perowne in the novel is a revelation of a strange reality. After the first meeting with Baxter, a criminal gangster, Henry questions whether this meeting was a kind of any sign? Moreover, he questions the human ability to perceive the world symbolically.

Perowne is an intelligent and a self-aware man “...a habitual observer of his own moods [who] is given to reveries about his mental processes” allowing the author to explicitly set out this theme. 

When Henry meets Baxter for the first time, he notices the specific tremor in the hands of the criminal (that tremor symbolized Huntington’s disease.) Being a neurosurgeon, Henry has a specific ability to notice some subtle signs of the human body which signal about various mental disorders. But where is this measure? Does this ability mean that people of other professions can have other abilities to predict people’s physical states and situations?

However, Henry is a special protagonist. McEwan conveys that “it’s an illusion to believe himself active in the story. Does he think he’s changing something, watching news programs, or lying on his back on the sofa on Sunday afternoon, reading more opinion columns of unfounded certainties, more long articles about what really lies behind this or that development, or what is surely going to happen next, predictions forgotten as soon as they are read, well before events disprove them?” (McEwan, Saturday: 64)

In this way, we can ask: what is really real during this day of Henry’s life? Are there any inner bonds between the facts in the array of situations which happened? What is reality: a visualization of the individual human perception and subjective interpretations of the facts or the ontological phenomenon which has its special nature? And how can a human being have knowledge about this nature?

In this paper we are going to draw your attention to these epistemological questions derived from the novel.

The writing history of Ian McEwan demonstrates several periods from Mr. Macabre to successful Hollywood writer. The novel we are going to discuss is a specific one. Saturday was written after a two-year period of observations in the neurosurgery hospital. Ian McEwan acknowledges Doctor of Medicine Neil Kitchens, who is a member of the Royal

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Surgery College, a consulting neurosurgeon and the vice-head of The National Hospital for Neurology and Neurosurgery, Queens-square, London. McEwan mentions some other professional doctors, surgeons of the traumatic surgery department of The Royal College of Surgeons of England. In addition, Kitchen testified that McEwan did not flinch in the theatre, a common first reaction to surgery; “He sat in the corner, with his notebook and pencil.”

Most of McEwan’s short stories concentrate on intra-personal matters of the narrator. Therefore, readers are given only one point of view on the situation and the opinion of other characters is given only by an unreliable narrator. Readers are, therefore, forced to guess the reality of the situation concerning the fact that the narrator is often emotionally undeveloped. There are described mainly infantile stages of emotional development in the short stories which is according to Byrnes on purpose. She remarks that McEwan concentrates on these themes in short fragmented stories because he wants to reflect “the disjointed nature and brief attention span of children.”

Saturday is a new English version of the mythological Ulysses by James Joyce which also goes about a day. This awe-inspiring text of the European modernism of the XXI Century portrayed new forms of time and space and their perception by a human being. Saturday demonstrates the new understanding of the issue which can be theoretically marked as “a mental being in time and space.” Mental processes in Henry’s mind are under the main focus in Saturday. For McEwan, it is highly important to analyze the inner forms of the human consciousness which is interpreted as a natural phenomenon with physical limitations and which exists according to the physical rules. Henry Perowne’s discourse reveals a philosophical and also a medical discussion about the nature of consciousness — whether it can be described as a ghost in the machine or as a net created by the human neuroactivity, or as an independent phenomenon which controls human emotions (psyche). This discussion about materia and qualia (let me use these original Latin notions) has its roots in the Antiquity period and it was newly accumulated in the 1960-s.

Our human body is a system of duality that modern sciences want to reject. We mean that the position of the Ghost in the Machine seems to be illogical in the modern neuro sciences.

It is what Gilbert Ryle denounced, in his book The Concept of Mind, as the fallacy of the Ghost in the Machine. According to this position, the human body, including the human brain which produces the phenomenon of mind, is a machine; there is no ghost, no soul or spirit, to be found in it. And the self is not an immaterial essence but an epiphenomenon of brain activity. To distinguish between flesh and spirit, body and soul, the material and the immaterial, the earthly and the transcendent, is to commit the fallacy of dualism, which runs deep through the history of Western culture, but is now dead and buried. Or it ought to be (Lodge: 8).

At the same time, some philosophers began to ask whether the dismissive catch-phrase “the Ghost in the Machine” really disposed of all the questions raised by the phenomenon of consciousness. Joseph Levine published an influential paper in 1983 entitled “Materialism and Qualia: The Explanatory Gap.” Qualia, plural of the Latin quale, is a key term in consciousness studies, meaning the specific nature of our subjective experience of the world (Lodge: 5).

So, what is consciousness? This question plays a central role for McEwan. In Saturday, he puts his heroes in stressful situations to underline this ambiguity of life as a contamination of irrational and rational even in the mind of a strongly logical man who perceives human beings as a set or network of neurons. A human being is displayed as an epiphenomenon. Anyway, is consciousness just separate software of our brains that seems to have any hardware? Is it just a derivation from the brain? Heroes’ confrontations in the novel precisely prove to the reader that there is no direct answer; however, there is an unknown type of relations between this human software and the hardware.

In the texts of Plato, we encounter this gap in the cosmological creation of the Universe—there is matter and qualia. Our new neurosciences’ results tend to reject this position—our consciousness is just a virtual system that does not exist in the world of matter but it just exists in our human machines because we are just human beings.

There are some thinkers in cognitive science, or on the fringes of it, who have acknowledged as much, Noam Chomsky, for instance, has said: "It is quite possible ... that we will always learn more about human life and personality from novels than from scientific psychology." The reason is that science tries to formulate general explanatory laws which apply universally, which were in operation before they were discovered, and which would have been discovered sooner or later by somebody. Works of literature describe in me guise of fiction the dense specificity of personal experience, which is unique, because each of us has a slightly or very different personal history, modifying every new experience we have; and the creation of literary texts recapitulates this uniqueness (that is to say, Jane Austen's Emma, for example, could not have been written by anybody else, and never will be written by anyone else again, but an experiment demonstrating the second law of thermodynamics is and must be repeatable by any competent scientist) (Lodge: 10-11).

McEwan seems to follow this position in Saturday. Understanding the principles of consciousness is an important theme of this novel which is a specific neo-

\[15\] Ibid.

mimetic novel. Christopher Hitchens hails McEwan a “chronicler of the physics of every-day life.” 17 CAH: Saturday (novel) - Wikipedia, the free encyclopedia.htm - cite_note-Hitchens-5%23cite_note-Hitchens-5 As Zoe Heller underlines, in Saturday, the characteristic virtues of structural elegance and coherence are on prominent display — not least in the Aristotelian discipline with which he has confined the temporal span of his story to a single day. 18 

The subjectivity of the novel corresponds with our real life from the position of sciences, medicine, and, speaking more specifically, neurosurgery.

“Who could ever reckon up the damage done to love and friendship and all hopes of happiness by a surfeit or depletion of this or that neurotransmitter? And who will ever find a morality, an ethics down among the enzymes and amino acids when the general taste is for looking in the other direction?” (McEwan, Saturday: 64)

However, Henry Perowne, the protagonist, is portrayed first as a god of the new age. And his religion is science. Besides, Henry, on the contrary, has a superpower of analyzing people; he has a strange lyrical power which corresponds with his medicalized analytical approach. Neurosurgery determines the way of world perception, interpretation and understanding in the analyzed novel. We must admit that Saturday is a good example of the post-postmodern (or in other words metamodern) literature of the XXI Century which represents new philosophical system based on the interaction between sciences and humanities. To some extent, we can feature the post-positivistic revelations in Saturday; however, they are transformed according to the new model of the human being Ian McEwan constructed in his novel.

Henry Perowne is a forty-eight-year-old neurosurgeon. For this post-postmodern novel, the notion ‘metamodern’ suits even more effectively as all the actions in the text happen during a day. Saturday is set in Fitzrovia, London, on Saturday, 15 February 2003, during a large demonstration against the invasion of Iraq. As Henry goes about his day, he ponders the meaning of the protest and the problems that inspired it; however, the day is disturbed and disrupted by an encounter with a violent man with mental disorder (the onset of Huntington's disease). Perowne considers that these day people have created also a new religion — shopping, consumerism (resulted in the consumer society.) However, sometimes (as in Baxter’s case) there is no religion to save a human being — neither religious faith nor science. In the end, the mock reader understands that science (medicine) is a kind of advanced religion of the new era which in fact is irrational and mythological to some extent.

Ian McEwan had a special interest in the relations between human beings (let us remind his Amsterdam or Atonement), the relations between people in social aspect, the relations between the human being and the reality with all its spatial


Contour Variation and Perceived Beauty of Polygon Shape

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Abstract
Observers rated the attractiveness of octagonal polygons that varied in contour length but with constant area. Shapes with partial symmetry were judged to be more attractive as were those with greater total contour length. In a second experiment participants judged polygons with different numbers of concavities but with constant perimeter length. Shapes with more concavities were considered more attractive. The data demonstrate a preference for greater articulation and variety – both quantitatively in terms of contour length and qualitatively as measured by changes in contour polarity. However, the results provide evidence against two other factors that have been discussed in the literature: compactness and angularity.

Keywords: Aesthetic judgment; Attractiveness; Polygon; Contour; Compactness; Symmetry; Angularity; Concavity.

Introduction
The role of complexity in aesthetic judgment has a long history. Early researchers using polygons found inverted U-shaped functions with peak preference at intermediate levels of complexity as judged by factors such as symmetry, balance, repetition, number of sides and vertex angle (see Roberts, 2007 for a comprehensive review). Other investigators have provided coding schemes and information processing models to account for aesthetic judgment of polygons (Boselie & Leeuwenberg, 1985; Katz, 2002). Recently, we have shown that observers like triangular shapes that are more compact (Friedenberg, 2012). We attribute these findings to the perceptual instability hypothesis, whereby shapes that appear less likely to move, topple or break are judged as more beautiful.

The original motivation for the current work was to generalize the instability hypothesis findings to more complex shapes. The prediction was that octagons with shorter perimeters would be preferred to those with longer perimeters when area is held constant, this being one geometric way to measure compactness. We define compactness (C) as the ratio of the area (A) to the perimeter (P), expressed as C = A/P. When A is large and P is small, C is high and the shape is compact. When A is small and P is large, C is low and the shape is diffuse. The measure P/A is the inverse of compactness and measures how much a shape’s contour meanders over space.

Experiment 1
In experiment 1 we varied the compactness of octagonal polygons to investigate what effect this may have on visual preference for these shapes. If compactness has a strong influence on perceived shape attractiveness we would expect compact forms to be rated as more beautiful. In contrast, forms that are less compact should be less attractive. In terms of complexity compact shapes can be considered as less complex because there is less contour as a proportion of the area. Consequently, less compact shapes are more complex because they contain a greater amount of contour relative to their area.

Method
Participants Twenty-one undergraduates from Manhattan College in New York participated for extra course credit. There were five males and 16 females. Average age was approximately 20 years. All participants’ vision was normal or corrected to normal.

Stimuli Each pattern was presented in the center of a computer monitor with a diagonal screen length of 43 cm. Average contour distance from the center of the screen was 50 mm. We generated contours in four steps. First, one of eight random orientations was chosen. These corresponded to the vertical, horizontal and two 45° oblique orientations. A direction and a distance, either toward or away from the center were then also randomly selected. This distance away from the baseline radius ran from 10 to 50 mm in 10 mm increments. A vertex was placed by this amount toward or away from the origin along the given axis. These vertices were then connected with straight lines (see Fig. 1).
**Procedure** Participants were asked to rate how attractive or beautiful the shapes were using a numeric scale that ran from 1–7 with higher ratings corresponding to greater perceived beauty. They responded by pushing one of these seven buttons on the computer keypad. They were given as much time as needed.

The primary independent variable was contour variance with five levels (10, 20, 30, 40, and 50 mm). Ten different patterns were generated for each level yielding 50 total trials in a block. An experiment session consisted of four blocks, totaling 200 trials total. Order of presentation within each block was randomized. Figure 2 depicts examples from each category.

**Results**

Mean and standard errors were calculated for each level of contour variance. These are shown in Figure 3. There was a significant effect of contour variance ($F_{4,100} = 13.37, p < .01$). Responding was higher for the 10 and 50 mm conditions. There was also a linear trend in the data increasing from 20-50 mm.

**Discussion**

Our results were the opposite of the pattern predicted by the instability hypothesis. The greater the perimeter length of the polygons the higher they were rated. This could be interpreted as an affinity for more complex figures within the range of variance tested. The 10 mm condition seems an exception. These polygons contained all convex angles and were globally quasi-symmetric. We attribute their increased liking to these characteristics, as symmetry and regularity, i.e., figural goodness from a gestalt perspective, are considered aesthetic properties (Nucci & Wagemans, 2007).

One account for the linear effect excluding the 10 mm case concerns local feature salience. Increased contour length increases the distances between adjacent vertices on the polygon so the straight lines connecting them are longer. This makes these features more jagged and distinct. Observers appear to like this property. It is of note that this is in direct
contrast to the finding that participants dislike angular shapes because they perceive them as a threat (Bar & Neta, 2007).

**Experiment 2**

In the current experiment we introduce qualitative variation in the form of polarities. If the vertex between two lines is convex it forms a protrusion away from the pattern center. When the vertex is concave the feature becomes an indentation toward the pattern center. The transition between a concave and convex vertex we refer to as a *polarity shift*.

Do the number of polarity shifts, measured as the number of concave vertices, have an effect on perceived attractiveness? If observers prefer more complex stimuli as they seem to in terms of contour length in experiment 1, then we can predict they will also prefer polygons with greater featural variety. More specifically stated, polygons with a greater number of contour polarity shifts should be preferred. In this study we generate octagons that vary in the number of times they switch between concave and convex features while holding contour length constant.

**Method**

**Participants** A total of 15 Manhattan College undergraduates participated in the study for extra course credit. There were two males and 13 females. Vision was normal or corrected to normal.

**Stimuli**

In our notation we use a lowercase v to designate a concave vertex and a lowercase x to designate a convex vertex. An octagon can contain between zero and four concavities. For the zero case we again have a quasi-symmetric polygon (denoted xxxxxxxx). There is only one instance with a single vertex (vxxxxxxx). There are three sequences of octagons with two concavities (vxxxxxxx, vxxvxxx, vxvxxxxx) two sequences with three concavities (vxvxxxxx, vxvxvxxx) and one with four (vxvxvxxx). Figure 4 shows an example for each.

**Procedure**

The procedure was identical to that of experiment 1. Participants viewed each polygon and rated their attractiveness on a seven-point scale with higher numbers indicating higher perceived beauty. As much time as necessary was given for each response. There were ten different examples for each of the eight conditions with a total of 80 unique stimuli per block. A session consisted of four blocks, yielding a total of 320 trials. Order of presentation was randomized within blocks. A session took about one-half hour to complete.

**Results**

We conducted a one-way ANOVA with contour polarity as the factor and ratings as the dependent measure. The effect was significant (F,112 = 77.52, p < .01). Means and standard errors for the eight conditions are depicted in Figure 5.

![Figure 4: Examples of polygons for each of the eight concavity conditions in experiment 2.](image-url)
Discussion

The quasi-symmetric polygons without concavities received only moderate ratings this time. The remaining conditions show a linear trend for patterns with two or more polarity shifts. Mean ratings for a single polarity shift stand about half way between the zero and two polarity shift conditions.

It is not clear why the all-convex shapes scored relatively lower compared to the previous experiment. Perhaps it is because the remaining conditions in this study are more appealing and provided response competition. The extended linear trend is present here however, with the exclusion of the zero and one polarity shift conditions. For these polygons observers preferred shapes with greater feature complexity as defined by the number of polarity shifts.

General Discussion

In two experiments we show a preference for polygons with greater complexity. In experiment 1, participants preferred patterns with longer contours when area was held constant. This manipulation produces greater featural variance and hence salience, suggesting preference for polygons with these properties. In experiment 2 we introduced a different type of contour variance by manipulating the number of polarity shifts or concave vertices. In this case there was also a general trend toward preferring increased complexity when the all-convex patterns are considered separately because of their symmetric quality.

The results of experiment 1 run counter to the notion that compact shapes should be preferred because they are less fragile, as would be predicted based on the perceptual instability hypothesis. Instead we see increased ratings for patterns with more varied contour, those that can be considered diffuse and less compact.

When triangles are made less compact there is a corresponding increase in the length of an elongation axis that contributes to perceived fragility (Friedenberg, 2012). This is not the case for the shapes used here. These polygons become more diffuse and varied through the growth of local features without the introduction of global fragility. This probably accounts for the difference. In future work we plan to vary the length of a global elongation axis in polygons independent from that of local feature length to tease these factors apart.

Our results also conflict with those of another finding in the literature. Bar and Neta (2007) have shown preference for shapes with less angularity, i.e. those that are less jagged and sharp looking. They argue that this is because these shapes are less threatening in appearance. Our study shows just the opposite. In experiment 1 there was increased preference for shapes that were more jagged. These results may be due to anchoring effects in which responses are scaled to the set of stimuli used. The difference between these two findings needs to be reconciled.

References


Perceived Beauty of Random Density Patterns

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Abstract
We report two experiments on the perceived aesthetic quality of random patterns. In each experiment a square grid was filled with a progressively larger number of elements. Participants rated the beauty of the patterns. Average judgments across all observers showed an inverted U-shaped function that peaked near the middle of the range. Across each study the number of elements and global pattern size increased while element size was held constant. Peak attractiveness functions for each experiment occurred at different numbers of absolute elements, suggesting unit-number invariance in which observers scale their responding to the range of stimuli experienced.

Keywords: Aesthetic judgment; Random patterns; Randomness; Complexity; Density.

Introduction
Research on the role of complexity in aesthetic judgment goes back many decades. Early researchers found peak preference at intermediate levels of complexity using basic forms such as polygons while varying characteristics like number of sides, angularity and symmetry (Roberts, 2007). There has been much less attention however devoted to the aesthetic qualities of texture patterns or of collections of aggregate elements. Much of the perceptual research on textures has focused on segmentation and classification. Recent efforts are now underway to investigate human affective interpretation and construction of predictive computational models (Kim et. al., 2006; Thumfart, et. al., 2011).

In this study we set out to investigate the aesthetic quality of a very basic texture property, namely density, characterized as the number of elements per square 2-D area. Density was manipulated using a square grid divided up into equally sized square cells. Differing numbers of these cells were filled to produce varying amounts of surface coverage. In two experiments we incrementally increased the number of elements in these patterns to investigate their effect on aesthetic judgment.

Experiment 1

Method

Participants Twenty-five undergraduates from Manhattan College in New York participated for extra course credit. There were five males and 20 females. Average age was approximately 20 years. Participant’s vision was normal or corrected to normal.

Stimuli Density was manipulated using a 10 X 10 cm square grid. Each cell was one square cm in dimension and each side of the square was 10 cm in length. Differing numbers of cells in the grid were filled randomly. The levels of density ranged from 10% to 100% in increments of 10%. Filled cells were black while empty cells remained white along with the background. There were no gridlines or rulers visibly present. Figure 1 shows some examples of the patterns employed.
Figure 1: The top pattern above is an example of a 40% filled texture field. The bottom pattern is an example of a 70% filled texture field.

**Procedure** Each pattern was presented in the center of a computer monitor with a diagonal screen length of 43 cm. Participants were asked to rate how attractive or beautiful the textures were using a numeric scale that ran from 1–7. They responded by pushing one of these seven buttons on the computer keypad. They were given as much time as needed. Observers were instructed to perceive the black-filled areas as figure and the white portions as ground.

Twenty-five observers viewed 10 different versions of the pattern at each density level. There were thus 100 trials in a block with four blocks yielding 400 trials per session. Order of presentation was randomized within block.

**Results**

There was a significant effect of density on response ratings as measured by a one-way ANOVA $F(9, 260) = 65.7$, $p < 0.1$. Ratings increased up to a 0.7 occupation probability (70% fill) then tapered downward after that. Figure 2 shows mean ratings as a function of density.

Figure 2: Average attractiveness ratings for density patterns in experiment 1. Error bars are ± one standard error of the mean.

In addition to density we obtained two derived measures of pattern complexity. We calculated contour edge length as the sum of the edge lengths for all the black cells in the pattern measured in centimeters. We then calculated the number of parts in the pattern. Black-filled cell regions were considered to be parts if they were joined by at least one side but not if they were joined at a corner. There was a significant correlation between ratings and contour length $r(48) = .47$, $p < .01$. There was no correlation between ratings and number of parts.

**Discussion**

Participants preferred patterns that were on average about 70% filled. This is where the peak in the ratings function occurred. Observers in this study also like patterns with the greatest contour lengths. If we take edge length to be a proxy for complexity than preference here is for the patterns with the greatest complexity.

One way to increase complexity is to simply increase the number of elements. If participants prefer patterns with more elements than ratings should be higher for these patterns. This is what we set out to do in the next experiment.
Experiment 2

Method

Participants A total of 15 Manhattan College undergraduates participated in the study for extra course credit. There were three males and 12 females. Vision was normal or corrected to normal.

Stimuli and Procedure
In this experiment we increased overall complexity by making the grid region larger. The global pattern area was now 15 X 15 cm but the size of the cells stayed the same. The filling process and conditions were otherwise identical to those in the first experiment.

Results
There was again a significant effect of density, \(F(9, 140) = 83.2, p < 0.1\). This time however responses peaked lower at a density of 0.5, where approximately half of the grid cells were filled. Average ratings for each level of density are shown in Figure 3.

As previously we also calculated total edge length and number of parts for each pattern to see if these were in any way predictive of ratings. There was a significant correlation between contour length and perceived beauty \(r(84) = .83, p < .01\) but not between number of parts and ratings.

Discussion
The findings of the second experiment confirm that textures with intermediary fill levels are considered the most beautiful. It also replicated the finding that contour length and not element number are psychologically important attributes in making such judgments.

General Discussion
The peak in the attractiveness function in experiment 1 occurred at 70 elements. For the second experiment it happened at about 113 elements. Since these two estimates differ by a fairly large number we conclude that element number under these conditions does not impact on perceived attraction. It does suggest that participants are making relative judgments, not absolute ones. Observers seem to be scaling their responses to the range of patterns seen in a given session, an example of unit number invariance.

It is difficult to define what complexity is in these patterns. One interpretation is that a few small elements at the low end of the density scale and a few large elements at the high end of the scale both constitute simple patterns whereas those in the middle, made of a combination of small and large parts, are the most complex. An analysis of edge length versus density shows an inverted U-shaped function, paralleling the ratings data. So responses are more likely peaking in a region of maximum complexity, not intermediary complexity. This result supports other evidence from our lab showing that observers also prefer polygons that are maximally complex. Of course complexity is always relative and there may be a limit to how much of it is preferred.

References
Exploring Emotional Responses to Computationally-Created Music

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Abstract
We explored whether individuals could be induced to believe that musical works written by human composers were computer-created and whether this perception would in turn influence their emotional and evaluative responses to the music. Results revealed that a clear majority of participants could be convinced that classical music selections that were actually written by expert human composers and performed by a computer were instead entirely computer-generated. Additionally, whereas there were reliable differences in participants’ affective responses to expressively happy versus sad songs, these responses were not reliably influenced by whether they believed the music selections presented had been composed and/or performed by the computer rather than by a human being. This held true even for individuals assessed as higher in music empathy as well as those with more extensive musical training. Results suggest that emotional responses to music do not require, nor are they necessarily moderated in their valence or intensity, by empathy with a perceived human agent.

Keywords: computer, emotion, empathy, music, preference

Introduction
In recent years, music scholars have made great headway in uncovering the processes by which music influences emotion, for instance, showing how the creation and violation of musical expectancies may engender feelings of awe, chills, or tension (Huron, 2006) as well as how subtle variations in dynamics and timing contribute to the perceived emotional expressivity of a given performance (Bhatara et al., 2011). Presumably, if sufficient knowledge could be garnered regarding the rules by which music elicits emotion, these rules could indeed be described mathematically and used to program computers to automatically generate music that closely emulates that produced by expert human composers and performers. Computer programmers have already made remarkable progress along these lines (see e.g., Cope, 2005).

Still, the question arises: Would individuals show a comparable emotional response to a particular piece of music if they believed it were composed and played by a computer as opposed to by a human being? Would the music make them feel equally aroused versus relaxed, happy versus sad under such circumstances? Presumably, emotional responses to music are at least partly driven by empathy for the composer or performer, who utilizes the instrumental and lyrical content of the music to express his or her feelings. Even in the absence of lyrics, music powerfully expresses emotion by dint of its isomorphism with many of the physical markers of emotional states. To illustrate, the timbre of a musical instrument may resemble that of a human voice expressing feelings such as joy or sorrow. Likewise, the rhythm of a musical performance may be akin to that of the bodily processes (e.g., heartbeat, respiration or patterns of physical motion (e.g., jumping, walking) that are associated with a given state of emotional arousal. Listeners may use such nonverbal cues to decode the emotional state expressed by the composer or performer, thereby enabling empathy. However, if the music was believed to be automatically generated by a machine, it would eliminate this source of empathic feeling, thereby potentially diminishing the overall breadth and magnitude of listeners’ affective responses to the music.

On the other hand, it is uncertain that any of the fundamental psychological processes by which music influences emotion should be substantially affected by whether music is perceived to be human versus computer-generated. According to Juslin, Liljeström, Västfjäll, and Lundqvist (2010), there are seven basic mechanisms by which music elicits emotions. First, as with attentionally salient non-musical sounds (e.g., a backfiring motorcycle or rumbling thunder), musical sounds that are particularly dissonant, loud, sudden, or elevated in tempo (e.g., a crashing cymbal, an orchestral crescendo), may heighten sympathetic nervous system activity, increasing pulse and respiratory rates and thereby giving rise to conscious feelings of arousal. Second, rhythmic bodily processes associated with emotional arousal, including heartbeat and respiration, may gradually become entrained to (i.e., synchronized with) a musical rhythm. Third, music may become associated over time with the emotion-eliciting situations in which it is often heard (e.g., birthdays, funerals, romantic encounters) such that it eventually comes to serve as a conditioned stimulus, independently triggering feelings related to these situations. Fourth, music may engender “emotional contagion”, in which the emotional expressions represented in the music are automatically mimicked by listeners, ultimately leading them to feel the emotions expressed.

The remaining mechanisms proposed by Juslin et al. (2010) to mediate affectively- valenced responses to music involve somewhat higher levels of cognitive processing. Specifically, Juslin et al. (2010) suggest that music may metaphorically represent actions or scenes that are viewed in...
everyday life, thereby conjuring up visual images of these stimuli. For example, a musical line which steadily decreases in pitch may lead an individual to imagine him or herself falling or sliding, thereby eliciting a sense of trepidation. Music may likewise elicit emotionally-evocative imagery drawn from episodic memory, as when an adult recounts a childhood summer vacation when hearing a song that he or she heard on the radio while traveling at the time. Finally, Juslin et al. (2010) note that music may stir emotions (e.g., satisfaction, yearning, surprise) by creating and then confirming, delaying, or violating expectations regarding how the music will unfold.

Given these various distinct processes by which music may shape emotional experience, the question again arises, would any of these mechanisms be influenced by the belief that music is wholly computer-generated? Upon reflection, perceiving the same piece of music as composed by a computer as opposed to a human being should not alter low-level reflexive responses to the suddenness, loudness, or sensory dissonance of the sounds that comprise the piece. It should not affect automatic entrainment of biorhythms to the musical pulse nor should it alter enculturated expectations regarding how the music will continue. Despite the belief that the piece lacks a human creative or expressive agent, it may still evoke similar visual imagery or memories (e.g., of pastoral beauty or youthful romance) and may still prompt automatic internal mimicry of the emotions it expresses. If so, the perception that a piece of music is computer-created may in fact only negligibly impact emotional responses to the work.

In the present study, we sought empirical evidence bearing upon this question regarding the nature of emotional responses to computationally-created music. To this end, we conducted an experiment in which we first led participants to believe that works of instrumental music written by expert human composers were instead generated by a computer. We then explored whether the perception of the music as computer versus human-created influenced emotional responses to, as well as enjoyment of, this music. We also took the opportunity to examine whether any differences in these responses were moderated either by musical training or “music empathy”, the ability or proclivity to empathize with the expressed feelings of musical composers and performers. Trained musicians often strive to take a composer’s perspective so as to better realize the communicative intentions of the composer in their own performance. As performers themselves, skilled musicians may also be better able or inclined to imagine what other performers feel while they are playing music (cf. Freedberg & Gallese, 2007). As such, those with more extensive musical training may be relatively likely to find their reactions to the music dulled in the absence of a human creator with whom to empathize. Although they are not necessarily musicians themselves, due to their inclination to think about the emotional states of composers and performers (Garrido & Schubert, 2011), those with greater musical empathy may likewise experience a diminished affective response to music that they believe was produced by a mechanical entity that lacks feelings with which to empathize.

**Experiment**

**Method**

**Participants** Participants were 58 undergraduates (20 male, 36 female, 2 gender unspecified) between the ages of 18 and 21 ($M = 18.26; SD = 0.74$), with a self-reported average of 3.41 years of group musical training ($SD = 3.28$; range: 0-14) and 1.76 years of private musical training ($SD = 3.13$; range: 0-14), who participated in exchange for course credit in an introductory psychology course at a state university in the northeastern U.S.

**Manipulation of Perceived Origin of Music** To convince participants that the music they were about to hear was computer-created, those randomly assigned to the computer-generation belief condition were instructed on-screen:

> In recent years, researchers have learned a great deal about the techniques used by composers to write music. Basically, composers learn to use a number of rules that allow them to string together notes in a way that sounds pleasing to the human ear. Computer scientists now know so much about these rules of composition that they can program computers to automatically select notes and rhythms according to the rules. As a result, computers can now create music of very high quality without any human input.

You will now hear a few short new classical music pieces that were automatically composed and played by a computer. The only thing done by a human being was to open a software program and press a key to tell the computer to begin composing a new piece in a particular style. These new musical pieces were then created, played, and recorded by the computer using software that imitates the sound of a grand piano.

**Again, not a single note of the music you are about to hear was written or performed by a person— it was entirely produced by a machine. Please listen attentively and then answer the questions that follow.**

Your responses will help us decide which stimuli to use for a future study on the role of the frontal cortex in auditory perception.

These instructions appeared alongside an image of the user interface screen from a piano synthesizer program. To further ensure that participants attended to and remembered the ostensible source of the music to which they were exposed, as each of the four music selections was playing, the user interface image was re-presented along with the caption, “Note: This music was automatically created and played by a computer.”

In contrast, in the human-generation belief condition, participants were instructed on-screen:

> In recent years, researchers have learned a great deal about the techniques used by composers to write music.
Basically, composers learn to use a number of rules that allow them to string together notes in a way that sounds pleasing to the human ear. Composers who learn a great deal about these rules of composition can use them to create music of very high quality.

You will now hear a few short new classical music pieces written by a composer in a particular style and then played and recorded in the studio by a musician using an electronic piano. Please listen attentively and then answer the questions that follow. Your responses will help us decide which stimuli to use for a future study on the role of the frontal cortex in auditory perception.

The latter instructions were accompanied by an image of the hands of a male pianist playing a digital piano keyboard. It was hoped that this image would reinforce the claim made to participants in this condition that the music was created by a human being. To further bolster participants’ attention to and memory for this claim, as each music selection was playing, the image of the pianist was re-presented along with the caption, “Note: This music was created and played by a pianist who has studied composition and performance.”

Musical Selections Participants listened to digitized recordings of four unfamiliar short classical piano pieces played using grand piano synthesizer software. Research has suggested that faster musical tempi are associated with the expression of happiness and that slower tempi are associated with the expression of sadness or solemnity. Moreover, several studies have shown that at least after approximately five years of age, major modes are associated with happiness or serenity and minor modes with sadness or lamentation (Gabrielsson & Lindström, 2010). Therefore, to serve as expressively happy musical selections, we chose two pieces, Krebs’ Burlesca in D Major (1.58 min) and Haydn’s Divertimento in G Major (3.37 min), each of which was performed at a fast tempo and written in a major key. Likewise, to serve as expressively sad selections, we chose another two pieces, Mendelssohn’s Venetian Boat Song (2.78 min) and Fiocco’s Suite in G Major, Op. 11 (1.95 min), which were performed at a slow tempo and written in a minor key.

Measures To assess emotional responses to the musical selections, participants were asked to indicate how each selection affected them using a variant of the Self-Assessment Manikin technique (SAM; Lang, 1980). Here, participants had to indicate which of a series of 9 humanoid figures ranging in their expressions from very relaxed to very stimulated (arousal subscale) and very sad to very happy (valence subscale) best represented how the music made them feel. Scores ranged from 1 to 9, with higher scores reflecting greater stimulation/happiness. Participants were also asked to indicate how much they liked each composition, on a 7-point scale labeled 1 (strongly disliked it), 2 (moderately disliked it), 3 (slightly disliked it), 4 (neither liked nor disliked it), 5 (slightly liked it), 6 (moderately liked it), and 7 (strongly liked it); how much they enjoyed each composition, on a 4-point scale labeled 1 (not at all), 2 (slightly), 3 (moderately), and 4 (extremely); how interesting they found each composition, on a 6-point scale labeled 1 (very boring), 2 (moderately boring), 3 (slightly boring), 4 (slightly interesting), 5 (moderately interesting) and 6 (very interesting); and how they would rate the quality of each composition, on a 5-point scale labeled 1 (poor), 2 (fair), 3 (good), 4 (very good), and 5 (excellent). (The latter four scales were constructed with the aim of providing each scale value with a meaningfully distinct verbal label. This led to the variability in the number of scale points used across items).

In addition, following collection of the dependent measures, participants were administered a two-stage manipulation check procedure. Specifically, participants were first asked, “Which of the following describes the music you heard in the version of the experiment that you completed?” with response options labeled 1 (The music was created and played by a pianist.); 2 (The music was automatically created and played by a computer.); and, 3 (Neither of the above statements describes the music I heard.). For participants who responded “3” to this item, another item followed: “Which of the following describes the music you heard in the version of the experiment that you completed?” with response options labeled 1 (The music was created by a pianist, but played by a computer.); 2 (The music was automatically created by a computer but played by a pianist.); and, 3 (Neither of the above statements describes the music I heard.).

Participants were also asked separately enter the number of years of “group/classroom” music training and “private/one-on-one” music training they had received. A composite measure of musical training was computed as Years of Private Instruction + .5(Years of Group Instruction). They then completed a 9-item measure of music empathy (a = .75 for the current sample) developed by Kreutz et al. (2008). Examples of items on the latter measure include, “I think that I can easily sense how performers feel while playing music,” and “When listening to music I feel I can understand the emotions the writer/performer is trying to express.” Responses were tendered on a 7-point scale, anchored at 1 (strongly disagree) and 7 (strongly agree).

Procedure Upon arrival at the lab, each participant was led to a computer workstation inside a private soundproof chamber. Participants were randomly assigned to a condition by the computer. Musical selections were presented using studio headphones. The order of differentially expressive musical selections (happy vs. sad) as well as the order of SAM items (arousal vs. valence) were counterbalanced between participants. All other measures appeared in the order of their description above.
Results and Discussion

Manipulation Check Out of 29 participants randomly assigned to the computer-generation belief condition, 21 (70.0%) reported that they believed the false assertion that the music they had heard was composed and played by a computer. Moreover, 28 out of 29 (96.4%) of participants in the human-generation belief condition asserted that they believed the pieces were entirely created by a human being. Among those for whom the manipulation was apparently unsuccessful, 4 participants in the computer-generation belief condition indicated that none of the options that they had been provided in the manipulation check described the music they had heard. Five others in this condition indicated that they believed the music selections were entirely human-created. In the human-generation belief condition, one participant indicated a belief that the music was entirely computer-created. (Again, all selections were in fact composed by humans and performed by a computer). Analyses were restricted to the 82.76% of participants for whom the manipulation was successful according to the foregoing results.

Responses to Music Descriptive statistics on all measures for participants in the computer and human-generation belief groups appear in Table 1. Scores were averaged for expressively happy and expressively sad songs, enabling computation of repeated-measures ANOVAs to assess differences in the emotional and evaluative impact of happy versus sad songs as a within-subjects variable. Here, expressively happy, relative to sad, songs led to greater feelings of arousal, \( F(1, 47) = 28.72, p < .001, \eta^2 = 0.38 \), as well as happiness, \( F(1, 47) = 61.84, p < .001, \eta^2 = 0.57 \), and were rated as more interesting, \( F(1, 47) = 4.68, p < .04, \eta^2 = 0.09 \), and more likeable, \( F(1, 47) = 4.44, p < .05, \eta^2 = 0.09 \), yet as not significantly different in quality. Happy songs were not significantly more enjoyable than sad songs, \( p > .10 \).

To address whether these emotional and evaluative responses were moderated by beliefs regarding how the music selections were created, we computed a series of one-way ANOVAs, comparing scores on each dependent measure between those who had believed the music was entirely computer-generated and those who had believed that the music was entirely human-generated. There were no significant differences between music-origin-belief groups with respect to either emotional arousal or valence following either expressively happy or sad musical selections (all \( F_s < 1.38, ps > .24 \)). In addition, perceptions that the music was computer-generated did not significantly alter judgments of how enjoyable or interesting it was. Liking for and ratings of the quality of sad songs also did not significantly differ by condition; however, individuals who believed the music was human- as opposed to computer-generated did find happy songs somewhat more likeable, \( F(1, 46) = 4.50, p < .04, \eta^2 = 0.09 \), and of higher quality, \( F(1, 46) = 5.06, p < .03, \eta^2 = 0.10 \) (see Table 1). These findings may suggest a bias to evaluate at least some subset of musical works more negatively when they are believed to be computer-generated.

ANOVA on each of our outcome variables were also computed examining interactions between Belief Group (computer- vs. human-generation) and both scores on the musical empathy and composite musical training measures. These analyses solely revealed a Belief Group \( \times \) Music Empathy interaction on ratings of liking for sad music, \( F(1, 44) = 4.60, p < .04 \). Decomposition of this interaction by experimental condition revealed that music empathy was robustly associated with greater liking for sad music when the musical selections were thought to be computer-generated, \( F(1, 19) = 19.75, p < .001 \), yet non-significantly associated with such liking when the selections were construed as human-generated, \( p > .48 \). Interpretation of this solitary, unpredicted interaction will be withheld pending replication.

Table 1: Descriptive statistics indexed by music-origin belief.

<table>
<thead>
<tr>
<th>Belief Regarding Music Origin</th>
<th>Computer-Generated</th>
<th>Human-Generated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( M )</td>
<td>( SD )</td>
</tr>
<tr>
<td>1. Arousal (Happy Music)</td>
<td>4.59</td>
<td>1.27</td>
</tr>
<tr>
<td>2. Arousal (Sad Music)</td>
<td>3.05</td>
<td>1.05</td>
</tr>
<tr>
<td>3. Valence (Happy Music)</td>
<td>6.43</td>
<td>0.94</td>
</tr>
<tr>
<td>4. Valence (Sad Music)</td>
<td>4.26</td>
<td>1.42</td>
</tr>
<tr>
<td>5. Enjoy (Happy Music)</td>
<td>2.59</td>
<td>0.64</td>
</tr>
<tr>
<td>6. Enjoy (Sad Music)</td>
<td>2.33</td>
<td>0.88</td>
</tr>
<tr>
<td>7. Interest in Happy Music</td>
<td>4.05</td>
<td>0.83</td>
</tr>
<tr>
<td>8. Interest in Sad Music</td>
<td>3.43</td>
<td>1.37</td>
</tr>
<tr>
<td>9. Liking for Happy Music</td>
<td>4.79</td>
<td>0.93</td>
</tr>
<tr>
<td>10. Liking for Sad Music</td>
<td>4.38</td>
<td>1.57</td>
</tr>
<tr>
<td>11. Quality of Happy Music</td>
<td>3.24</td>
<td>0.85</td>
</tr>
<tr>
<td>12. Quality of Sad Music</td>
<td>3.14</td>
<td>1.09</td>
</tr>
</tbody>
</table>

General Discussion

In this study, we investigated whether the belief that a piece of music is computer-generated affects the manner in which individuals respond to it emotionally. Consistent with previous findings, participants reported feeling happier and more physiologically aroused in response to expressively happy relative to sad songs. However, these responses were not significantly affected by whether the music was perceived to have been automatically composed and played by a computer versus written and performed by a trained (human) musician. Together, the results of the study suggest that emotional responses to music do not require, nor are they necessarily moderated in their valence or intensity by empathy with a perceived human agent. To be clear, these findings by no means indicate that empathy with a composer or performer does not appreciably contribute to music’s powerful ability to sway human emotion. However, the findings may suggest that processes...
such as emotional conditioning, implicit mimicry, and rhythmic entrainment, which do not demand taking the perspective of another animate being, may be more essential to generating musical feeling.

Notably, beliefs regarding the origin of musical selections (computer- vs. human-generated) also failed to significantly influence enjoyment of or interest in the music. The study did reveal a tendency for participants to find happy musical excerpts more likeable and of higher quality when they were believed to have been human-generated. Such effects may suggest that music believed to be computationally-created threatens valued beliefs in human exceptionalism thereby diminishing liking for such music. Again, individuals may also assume that computers simply cannot produce music that is as emotionally expressive as that generated by a human composer/performer, biasing them to judge the music as lower in quality. Still, these effects were only found for expressively happy excerpts, making them difficult to account for theoretically. Moreover, the effects were small and did not seem to be associated with any changes in affective valence or arousal in response to the musical selections. As such, it would be premature to draw any conclusions from these particular results, although they certainly merit further study.

It is also noteworthy that emotional responses to music believed to be computationally-created did not significantly differ for individuals assessed as higher in music empathy or for those with more extensive musical training. To reiterate, it was proposed that such individuals may experience a diminished affective response to music that they believe was produced by a mechanized entity that lacks feelings with which to empathize. Although conjectural, one potential explanation for the abovementioned lack of moderation may be derived from the theorizing of Garrido and Schubert (2011), who have proposed that “…[s]ince music often is imitative of human expression of emotion in various ways such as in speech…some listeners may imaginatively create an object—the non-existent person expressing the emotion—and experience an empathetic response towards that object…” (p. 281). Given that computer-generated music may continue to resemble human emotional expression in terms of its dynamics, rhythm, and timbre, it may still lead individuals to imagine and empathize with some animate entity, however abstract, that they have conjured up in their minds. This empathetic response, developed over a lifetime of practice empathizing with human musical composers and performers, may occur relatively automatically and could be difficult to suppress, even when listeners are cognizant that the music they are listening to has been computationally-generated.

Looking ahead, the present study also lays the groundwork for empirically exploring a number of other provocative questions. To illustrate, participants in this study were only exposed to pure instrumental music; however, music empathy may be most potently and reliably elicited by the sound of a singing voice as well as by the contents of song lyrics. Interestingly, it may soon be possible to conceptually replicate the present study using faux vocal works “sung” by a voice synthesizer with entirely computer-contrived music and lyrics. It would be curious indeed if individuals found such music about equally moving irrespective of whether it was produced by a human agent or a skillful automaton.

Another avenue for further study concerns the potential moderating influence of pre-existing emotional states on how perceived human agency shapes musical feeling. Psychologists have long grappled with the ostensible paradox of “counter-hedonic” media preferences, the tendency for individuals to seek out forms of media that express negative emotion, including sad films and music. One explanation for such behavior is that when individuals are themselves suffering emotionally, they wish to feel that they are not alone in their despair or that others are in fact worse off (Zillmann, 2000). Likewise, they may be motivated to gain insight into the causes, consequences, or prospective means of coping with their emotions by turning to entertainment options that directly or symbolically portray other individuals dealing with similar feelings. Critically, for music to fulfill these social comparison or truth-seeking motivations, individuals must perceive that the music reflects the real-life experience of another human being, with whom they might share or compare their misery or from whom they might seek insight or wisdom. Therefore, it is possible that individuals who are already experiencing emotional distress may be less responsive to computer-created music, as this prevents them from implementing strategies of mood-regulation. This absence of human agency may even heighten feelings of isolation among those who are already feeling alone in their despair.

In sum, our work leaves behind a number of issues to be investigated in subsequent studies. Clearly, music is an extraordinarily complex stimulus that can potentially influence affective experience through a range of distinct mechanisms. Understanding how these multifarious processes operate will require systematically isolating both specific features of and specific responses to music and gauging how these function, if at all, within each process. To our knowledge, the present study represents the first attempt to isolate the impact of human agency perceptions on musical feeling. We hope that it will stimulate further research aimed at revealing how music stirs our passions, and more specifically, at clarifying the extent to which the creation of emotionally evocative music requires the direct input of a living, feeling creator.

References


Verbal Interferences in the Visualization of Mental Contents

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Abstract
Language and thought are tightly connected. Synesthetic perception and some rhetorical figures are examples of that “connection” - an excerpt of the sensory perception is “superposed” to a linguistic sign or to a part of it. What happens though when a perception does not “match” with any sign and viceversa? I asked eight students from the Brera Academy of Fine Arts to graphically represent three concepts: ‘myself’, ‘the person I love’, and ‘self-portrait’. The concepts that affect the private sphere of interest (myself, the person I love) are much more similar to each other than with respect to the stimulus control (self-portrait). The former appear more complex and morphologically articulated, without a center, as if they were not yet framed in an unique way.

Keywords: synesthetic perception, language-game, mental representation.

General Introduction
1. In the artwork series ‘Aleatop’ (1983) Anna Homberg sought to visualize a series of “mental concepts” by overlapping shapes (and colors) taken from a selected sample. It is not necessary going to go back to the origin of the ancestral interaction between language and thought to state that thinking something is not the same as describing the same thing. A disconnection that appears between artistic and scientific research as rightly pointed out by Homberg: “The artistic avant-garde [...] often reach complex and very refined conclusions, risking though, perpetual arbitrariness [...]. Scientific research, on the other hand, [...] one finds often analyzes shreds of reality so elementary that the results [...] are of a staggering banality.”

2. It offers one the opposition between (two) equally undesirable alternatives: arbitrary or banal, with language being the judge. If the “shred of reality” is not small enough to allow a detailed description you risk the arbitrary, if it is, it sinks into banality. Furthermore, even if a comprehensive description of such a ‘shred’ were possible, communication free of a rapport is not possible (Wittgenstein, 1953). Conditions add one (at least) level to the problem of the description of the ‘shred’, which makes evident two (at least) distinct outcomes.

3. The first is that which occurs when a portion of the meaning or sense (semantic space) of a sign finds correspondence in that of another. Such is the case that takes place in isomorphism or synesthetic perception (Koffka, 1935). Symbols, allegories and metaphors are based on similar processes and correspondences. The second occurs when the portion of the sense or meaning of a sign does not find correspondence in that of any other. The transition from one to the other does not come naturally, it must be created afresh. The interpreter is confronted with a new and unpredictable situation to solve that may not to build on known resources.

4. The work presented deals experimentally with the latter case. More specifically, it deals with the possibility of researching the visualization of mental content that excludes - if possible, or as far as possible - the verbal-linguistic dimension of the description that emphasizes its’ subjective individuality. But this is not the only objective of this study. One wants to attempt to understand whether this enormous amount of material, which scientific requirements often remove from their interests, cannot be reclaimed in view of finding a more satisfactory balance between arbitrariness and banality.

Experiment
Introduction
This work is an experiment on the non-figurative and non-symbolic representation of mental contents of which here, I will present the more direct aspects that relate to the subject of the portrait. The irreducible ambiguity of a particular sign is internal to a series of factors (values, functions, historical or individual variables, ...) that regulate the relationship signifier-signified.

It is for good reason that in Saussure’s definition, the sign comes from the union of meaning and significance, that is, the complex network of relationships that binds them (and it is also for good reason that Saussure always speaks about synchronic primacy in the study of language [1922]). The experiments on isomorphism and synesthetic perception do very well to explain why the codes that are not represented can also productively perform representative purposes. Some simple examples may help. Modern poetry has often made use of the sign, of the syntagm, of the typeface as poetic value in itself, or has reduced the verse to unpronounceable strings of vowels and consonants that are apparently meaningless. If viewed from this point of view, different forms of expression, e.g. futurist and dadaist that would seem to look alike, but actually there is a huge difference between the Bombardment of Adrianople of Filippo Tommaso Marinetti and the Ursonate of Kurt Schwitters. In the first case, the onomatopoeic and synesthetic elements clearly play a key representative, in the other definitely not. The same can be observed in painting, in music, in film - in brief everywhere a sign is structured according to the rules of the language, or ends up being absorbed by it. It is therefore with a degree of ambiguity, but also complexity and cognitive
Problematicity, that I have chosen stimulus material around which this work revolves. In particular, aiming for concepts whose interpretation could not be based on anything other than one's own experience, of which ready-made models possibly did not exist.

**Method**

Creation of graphic master. On a sheet of A3 paper (297 x 420 mm), I randomly drew 100 points that I highlighted with a circle of 1 mm in diameter resulting in a clearly visible and reproducible master. This master was then used to graphically display, by combining the various points, the mental content of certain verbal stimuli.

**Instructions.** Participants were asked to create a representation of the verbal stimulus joining the points on the graphic master so as to obtain one or more closed shapes. Apart from a few simple practical suggestions, instructions emphasized the subjective aspect of the test recommending in particular to "pay no attention to the real and tangible end look [of the stimulus]" that is "don't attempt a truthful or symbolic representation," but "try to trace the shape best suited to representing the stimulus subjectively and emotionally" without concern of any kind since it was not "an experiment on creativity and originality."

**Procedure.** Each participant received a master on which to perform the design, instructions and verbal stimulus (activating the mental content) to graph. Only a graphical response to the stimulus was required and there were no time limits for the execution of the task. If the subject wanted they could grapple with a verbal stimulus different from the previous, spending a period of time that could have gone as little as a few minutes to a maximum of seven days. The participants in the experiment were eight volunteer students from the different schools of the Brera Academy of Fine Arts, who were then subjected to the following verbal stimuli: (a) myself; (b) the person I love; plus a third stimulus (c) portrait. The tests were individual and the responses to portions of meaning of the stimuli that led to them would be more than justified. In this regard the responses to stimuli (a) and (c) appear to be particularly significant, in that from a lexical point of view they could almost be considered synonyms. Nevertheless a difference does exist, that I feel must be mentioned so as to frame the results in the right light, or at least make an attempt: that what is observed here seems to go beyond the so-called problem of interaction semantics (Capozza, 1977). The 'self portrait' can be legitimately resulting from a communicative dimension that combines in an often ambiguous manner the inner and the public sphere, indeed, representative. The responses to the stimulus (c) proceed in this way, proposing to the outside perfectly recognizable symbols, simple and iconic shapes, semantic crystallizations good for all occasions, but also sufficiently rewarding representations that can be shown without the necessity to say everything, grandiose and nonchalant at the same time. The response to the stimulus “myself” necessarily moves the focus upon oneself (or so I would interpret from the responses documented, although numerically scarce). It is not about demonstrating something to someone else but, first of all, trying to understand something not entirely clear, certainly not reducible to any known pattern. In this sense, I feel I can read the relative similarity between the responses to stimuli (a) and (b). It is perfectly appropriate that questions veil the vision of the person to which those questions belong, and for still stronger reasons, also to the object of love.

**Results and Conclusions**

Reported below are all the responses to the verbal stimuli produced by the eight participants (redrawn by the writer on the same master used in the original). The orientation of the drawing is the one chosen by the author. Even at the first superficial glance there clearly emerges a difference between the responses to stimuli (a) and (b) from those of stimulus (c).

There is considerable difference also in the light of the morphological-spatial parameters such as simplicity (the answers to stimulus (c) are mostly just articulated figures, 'simple' with respect to the reduced number of segments that describe them); symmetry (the shapes almost always have at least one axis of symmetry); the relative size (the shapes almost always occupy a portion of space significantly smaller than that occupied by the representations of two other mental contents); and the position on the sheet (well centered in the middle), or synesthetic (some rare dynamic suggestions, e.g. in 5 - and 8c). The responses to stimuli (a) and (b) present instead exactly the opposite characteristics. Undoubtedly, the results seem to be going in the direction of the outlined hypothesis.

The temptation to read them as an expression of different adherences to portions of meaning of the stimuli that led to them would be more than justified. In this regard the responses to stimuli (a) and (c) appear to be particularly significant, in that from a lexical point of view they could almost be considered synonyms. Nevertheless a difference does exist, that I feel must be mentioned so as to frame the results in the right light, or at least make an attempt: that what is observed here seems to go beyond the so-called problem of interaction semantics (Capozza, 1977). The "self portrait" can be legitimately resulting from a communicative dimension that combines in an often ambiguous manner the inner and the public sphere, indeed, representative. The responses to the stimulus (c) proceed in this way, proposing to the outside perfectly recognizable symbols, simple and iconic shapes, semantic crystallizations good for all occasions, but also sufficiently rewarding representations that can be shown without the necessity to say everything, grandiose and nonchalant at the same time. The response to the stimulus “myself” necessarily moves the focus upon oneself (or so I would interpret from the responses documented, although numerically scarce). It is not about demonstrating something to someone else but, first of all, trying to understand something not entirely clear, certainly not reducible to any known pattern. In this sense, I feel I can read the relative similarity between the responses to stimuli (a) and (b). It is perfectly appropriate that questions veil the vision of the person to which those questions belong, and for still stronger reasons, also to the object of love.

**References**


Figures 1-8: All the responses to the verbal stimuli: “myself” (A), “the person I love” (B), “self portrait” (C).
Curved Contours are Preferred over Sharp Ones
Even in the Absence of Semantic Meaning

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Abstract
It has been claimed that humans prefer curved contoured objects (Bar & Neta, 2006). Said preference has been hypothesized to result from a primitive perception of sharp transitions in contour as conveying a sense of threat. Following an approach-avoidance framework, we devised a two alternative forced choice experiment (2AFC) that sought to minimize the semantic content of the task. Two conditions were tested with this design: one in which images depicting real objects were presented, and another in which meaningless patterns were. In both cases, participants showed a significant tendency to prefer the curved version of the stimuli. These findings are consistent with previous research and show this design to be a promising tool for investigating preference for curvature.

Keywords: Experimental Aesthetics; Visual Preference; Curvature; Evolutionary Aesthetics; Evolutionary Psychology.

Introduction
That curved contours appear to be more pleasurable to the human eye than straight lines is a recurrent theme thorough aesthetic literature. Already in 1906, George M. Stratton gave notice of the first misguided empirical attempts to explain such preference by relating it to the movements of the eye. More than a decade later, the pioneering work of Lundholm (1921), Poffenberger & Barrows (1924) and Hevner (1935) established a relation between the angularity of lines and different feelings, with curved lines being perceived as more peaceful overall.

In spite of these earlier findings, experimental literature about the topic became sparse through the 20th century. It is not until the last decade, following the work of Bar & Neta (2006, 2007), that there has been a renewed interest for curvature. By presenting participants with different images varying only in the angularity of their contour, they found not only that there was a preference for curvature, but that sharp contours were perceived to be more threatening. At the same time, they observed increased bilateral amygdala activation when participants were presented with sharp stimuli, as it would be expected if said stimuli did elicit a sense of threat.

Later, Leder, Tinio & Bar (2011), while replicating Bar & Neta’s finding about preference, would report an interaction between valence and curvature, with curvature being preferred only when objects were neutral or positive in emotional valence.

Taken together, these findings lend themselves to support the hypothesis that preference for curvature results from a primitive perception of sharp transitions in contour as conveying a sense of threat, which seems consistent with previous research linking sharpness to negative emotions.

Furthermore, the idea that contour might convey preconscious meaning that underlies our higher level faculties of thought and communication fits perfectly with Johnson’s proposal for the study of aesthetic as the study of the human capacity to make and experience meaning (Johnson, 2008).

Still, we find that, in order to make such claims, the empirical research has to be extended to include different cultures and non-human primates. With this in mind, we devised a two alternative forced choice task (2AFC) with minimized semantic content so that we could gather and compare data from such disparate contexts with a higher degree of validity.

Methods
We used a subset of black and white images previously employed by Bar and Neta (2006) to create two experimental conditions. In the first condition, images of real objects were paired to build 36 target pairs, each one of them consisting of two versions of the same object, mostly differing in their contour, be it curved or sharp (Figure 1). This set was complemented with another one consisting of 36 pairs of distractor stimuli: objects matching in their overall contour, but conveying different semantic meanings. Furthermore, in order to avoid possible bias due to lateralization, two blocks,
consisting of the same pairs of images each, were constructed; so in one of them half of the images would appear on one side of the screen, while in the other block they would be shown on the opposite side. The order of both blocks was randomized, as was the order of the set of trials that conformed each of them.

In the second condition, the stimuli consisted in novel patterns created by Bar & Neta (2006), paired in a similar manner as the images from condition 1 (figure 2).

Participants were sat 50 to 60 cm from the screen in an isolated room, and instructed to select one of the images shown in a 2AFC task, by means of pressing a keyboard arrow that indicated the position of the selected image. These instructions specifically avoided the use of terms such as wanting, liking or preferring. Instead, our procedure implemented the action of approaching or avoiding the stimulus by enlarging the chosen image, in order to lessen the explicit semantic content of the task.

A trial consisted of a fixation cross being shown for 500ms, followed by a pair of stimuli displayed for 80ms. These images were then immediately replaced by a pair of light grey squares, which reminded the participant of the need to make a choice, while minimizing possible after-effects (Figure 3). Once one of the images was selected, it was shown once again for 1 second, centered, and at twice its original size.

20 students (18 females, age \( M = 20.75, SD = 4.60 \)), from the University of the Balearic Islands, took part in condition 1. 27 different students (24 female, age \( M = 21.89, SD = 6.95 \)) took part in condition 2. All of them were naïve to the goals of the experiment and had normal or corrected-to-normal vision.

**Results**

The preliminary analysis is based on the proportion of trials in which the participants chose the curved stimulus; the hypothesis being that if it were to be significantly higher than chance (0.5), it would mean that there was an effect of preference for curvature.

There were no outliers in the real objects condition, and a Shapiro-Wilks test revealed that the data was normally distributed, \( W = 0.97, p = 0.74 \). A one-sample t-test demonstrated that participants chose the curved stimuli \( (M = 0.58, SD = 0.14) \) significantly above chance, \( t(19) = 2.69, p = 0.014, 95\% CI: (0.52 – 0.65) \).

Two outliers were removed from the novel patterns condition. After the Shapiro-Wilks test found the distribution to be non-normal, \( W = 0.92, p = 0.047 \), an exact Wilcoxon signed-rank test was performed. Once again, the percentage of curved stimuli chosen by the participants \( (Mdn = 0.54, SD = 0.095) \) was significantly above chance, \( W = 196.5, Z = -2.94, p = 0.003, 95\% CI: (0.51 – 0.61) \).

**Conclusion**

Our data is consistent with previous research and shows that preference for curvature occurs even when the stimuli presented is devoid of semantic meaning and the task given to the participant does not require from her to make an explicitly aesthetic judgment. These findings support the original hypothesis and strengthen the idea that curved and sharp contours convey their very own, primitive, aesthetic meaning to the world we perceive. Still, further research is needed in order to clarify the nature of such meaning, and whether this is a developmentally acquired trait or a universally innate one.
Acknowledgments
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References

Abstract

The overall purpose of our study is to scientifically elucidate the aesthetics of Japanese Zen gardens. This article reports on an experiment that examined the relationships between the spatial and aesthetic feelings caused by the environment of different gardens. A virtual-reality device presented 18 gardens located in traditional temples in Kyoto. Participants rated each environment with respect to spatial feelings (complexity, naturalness, spaciousness, and enclosure) and aesthetic feelings (interestingness, calmness, and beauty). Our analyses show that all aesthetic feelings are either positively or negatively correlated with complexity and naturalness, and that calmness is also associated with enclosure. We discuss these results in relation to theories on aesthetics that were developed by Daniel Berlyne, James Russell, and Jay Appleton.

Keywords: Japanese Zen garden; dry landscape (kare-sansui) style; aesthetic feeling; spatial structure; virtual reality

Introduction

Japanese Zen gardens attract people not only because of their religious significance, but also because of their distinctive aesthetics. They are typically composed of rocks, plants (moss, trees, and bushes), and white sand that is raked to represent ripples. This design style is called kare-sansui (i.e., dry landscape), and is generally thought to represent miniature natural landscapes in an abstract manner. Some gardens have an extremely simple composition, as illustrated in Figure 1, while others represent relatively complex scenery, such as a Chinese landscape painting. Zen gardens are usually located adjacent to a structure called a hojo or shoin, and can be observed from the structure’s porch or interior, as shown in Figure 2.

Studies have considered the aesthetics of Japanese Zen gardens, especially their arrangement of rocks. For example, van Tonder, Lyons, and Ejima (2002) applied a visual processing model to analyze the rock garden at Ryoan-ji temple—one of the most famous Zen gardens (Figure 1). They found that a hidden order could be identified within the rock arrangement. Such an order has been shown to affect observers’ evaluation of pattern goodness (Miura, Sukemiya, & Yamaguchi, 2011). The relation between aesthetic feelings and rock arrangements has also been examined by Suzuki, Fujimoto, and Tsuji (2010), who applied the Voronoi tessellation to describe several properties of arrangements. In addition, Mochizuki, Cai, Asai, Wang, and Fukumoto (2010) conducted an eye-tracking experiment at the rock garden to analyze the visual effect caused by its rock arrangement.
However, the aesthetics of Japanese Zen gardens are not attributable solely to local design elements such as their rock arrangements. Appleton (1996, pp. 201–202) argued that traditional Japanese gardens are characterized as being enclosed by walls, and also that the environmental enclosure contributes towards the gardens’ aesthetics. It is well known that the garden at Ryoan-ji temple is designed to exaggerate the sense of perspective by incorporating changes to the wall height, and slanting the ground surface (e.g., Miyamoto, 2001). In relation to these features, Miura et al. (2011) reported that there is a correlation between the evaluation of rock arrangements and the impression of spatial extent within the garden. Moreover, Maki and Fujinaka (2012) analyzed four traditional Zen gardens with respect to their overall spatial composition, including the adjacent structures. Thus, the aesthetics of Zen gardens are probably associated with multiple spatial properties, including both local and general aspects.

Based on this background, our study is intended to achieve a comprehensive understanding of the aesthetics of Japanese Zen gardens. As described above, earlier studies have suggested that the aesthetics of Zen gardens are related to several spatial properties such as complexity, naturalness, spaciousness, and enclosure; however, it is still unclear how the properties create a distinctive aesthetic experience. In this article, we report on a psychological experiment to examine the relationships between the spatial and aesthetic feelings caused by the environments of different gardens. Our hypothesis is that the aesthetics of Zen gardens arise from a combination of multiple spatial feelings.

Method

In order to achieve the aims of the study, a field survey and a virtual-reality (VR) experiment were conducted. As shown in Table 1, we selected 18 gardens located in traditional Zen temples in Kyoto, all of which are designed in the typical kare-sansui style mentioned above.

Field Survey

The survey included photography and spatial measurement of the gardens’ environments. At each garden, we defined the standard observation point as the center of the structure’s porch that faced the garden. A digital camera (Canon EOS

Table 1: List of Japanese Zen gardens sampled for this study.

<table>
<thead>
<tr>
<th>Temple</th>
<th>Name of garden</th>
<th>Period of creation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daisen-in</td>
<td>Hojo mae niwa</td>
<td>Muromachi period</td>
</tr>
<tr>
<td></td>
<td>Shoin teien (east)</td>
<td>Muromachi period</td>
</tr>
<tr>
<td></td>
<td>Shoin teien (northeast)</td>
<td>Muromachi period</td>
</tr>
<tr>
<td>Funda-in</td>
<td>Tsurukame no niwa</td>
<td>Muromachi period</td>
</tr>
<tr>
<td>Ryoan-ji</td>
<td>Sekitei</td>
<td>Muromachi period</td>
</tr>
<tr>
<td>Entoku-in</td>
<td>Kita niwa</td>
<td>Momoyama period</td>
</tr>
<tr>
<td></td>
<td>Minami niwa</td>
<td>Showa period</td>
</tr>
<tr>
<td>Konchi-in</td>
<td>Tsurukame no teien</td>
<td>Edo period</td>
</tr>
<tr>
<td>Myoren-ji</td>
<td>Jyuroku-rakan sekitei</td>
<td>Edo period</td>
</tr>
<tr>
<td>Shoden-ji</td>
<td>Shishinoko-watashi teien</td>
<td>Edo period</td>
</tr>
<tr>
<td>Daikomyo-ji</td>
<td>Gabizon no niwa</td>
<td>Showa period</td>
</tr>
<tr>
<td></td>
<td>Shinji no niwa</td>
<td>Showa period</td>
</tr>
<tr>
<td>Ryogen-in</td>
<td>Ishidian</td>
<td>Showa period</td>
</tr>
<tr>
<td></td>
<td>Kodatei</td>
<td>Showa period</td>
</tr>
<tr>
<td></td>
<td>Totekiko</td>
<td>Showa period</td>
</tr>
<tr>
<td>Zuiho-in</td>
<td>Dokuza-tei</td>
<td>Showa period</td>
</tr>
<tr>
<td></td>
<td>Kanmin-tei</td>
<td>Showa period</td>
</tr>
<tr>
<td>Kodai-ji</td>
<td>Hashin-tei</td>
<td>Heisei period</td>
</tr>
</tbody>
</table>

Note. The periods of creation include inferential data, and some gardens have been modified and restored during the course of their long history.

At the time of our survey, this garden was temporarily decorated with artwork depicting a huge dragon, due to a special event that incorporated night-time illumination.

Figures

Figure 2: Side cross-sectional view of a Japanese Zen garden. The observer is enclosed by the environmental surfaces, including walls and trees ahead as well as a structure behind.

Figure 3: Snapshot of the experiment conducted using a virtual-reality device. This device provided a virtual experience of being at an observation point of each garden and freely observing the surrounding environment.
5D Mark II) was positioned at a height of 1.5 m and equipped with a fisheye lens (SIGMA 8mm F3.5 EX DG Circular Fisheye or 15mm F2.8 EX DG Diagonal Fisheye) and a panoramic tripod head (Nodal Ninja 4). From this position, we took several photographs of the surrounding environment in order to obtain images covering all directions. These photographs were taken when no one was in the vicinity. Using a piece of software (PTGui Pro ver. 9.1.6), we then created a panoramic image for each garden from the photographs, as shown in Figure 1. The created images were presented as stimuli in the following experiment. In addition to the photography, we used a 3D laser scanner to measure the spatial layout of the gardens’ environments. An analysis of these spatial data was reported in a previous article (Inagami, 2013).

Virtual-Reality Experiment

A psychological experiment was conducted to investigate the feelings that observers experience at the gardens. It is difficult to conduct an on-site experiment with such an aim, as Zen temples are religiously significant places, and because some gardens are often crowded with tourists. For these reasons, the present experiment employed a VR technique.

Participants. A total of 30 graduate students (22 males and 8 females) participated in the experiment. All participants were Japanese, but they did not have specialized knowledge concerning Zen gardens. We obtained informed consent from the participants in advance, and financially compensated them for their time.

Experimental Device. As shown in Figure 3, we created a portable VR device consisting of a head-mounted display (SONY HMZ-T2), a mobile PC (Apple MacBook Air), and a keypad. This display presented images at a resolution of 1280 x 720 pixels and a diagonal visual angle of about 45°. We applied a technique called Flash VR panorama to present the gardens’ images without the projective distortion seen in Figure 1. A piece of software (Pano2VR ver. 3.1.4) was used to convert the images into the Flash file format. Due to this technique, the participants were able to change their viewing direction by operating the keypad; that is, they were able to virtually look around each garden from the observation point.

Procedure. Each participant was presented with the 18 gardens in a random order. For each garden, the participants freely observed the environment for one minute and then rated it with respect to spatial feelings (complexity, naturalness, spaciousness, and enclosure) and aesthetic feelings (interestingness, calmness, and beauty). Here, we defined naturalness as whether the environment felt “natural” or “artificial,” rather than “natural” or “unnatural.” The feelings were orally rated on a 10-point scale, where 10 was the highest score. Concerning the basis of the rating, we instructed the participants to consider the scores of 1 and 10 to be the lowest and highest levels imaginable, respectively. For instance, complexity was rated by imagining various Zen gardens and then assigning a score of between 1 and 10 to represent the least and most complex gardens.

Data Analysis

The relationships between spatial and aesthetic feelings were analyzed through the following process. The rating data were first standardized to z-scores (i.e., M = 0, SD = 1) for each participant and feeling, and then averaged across all participants. We then performed multiple regression analyses, with each aesthetic feeling as an objective variable. Explanatory variables were chosen from the four spatial feelings using the forward selection method, where the selection criterion was set at an F-statistic of 2.0.

Results

Figure 4 illustrates the models of the relationships between spatial and aesthetic feelings that were obtained from the regression analyses. As shown in Figure 4a, interestingness increased with complexity and decreased with naturalness. In contrast, calmness decreased with complexity and increased with naturalness (Figure 4b). In addition to the two spatial feelings, enclosure was found to have a positive correlation with calmness. Finally, beauty rose with both complexity and naturalness, although this model does not provide as good a fit compared to the others (Figure 4c). To sum up the results, all aesthetic feelings were, either positively or negatively,
correlated with complexity and naturalness, and only calmness was additionally associated with enclosure.

**Discussion**

Our results highlight correlations between spatial and aesthetic feelings in Japanese Zen gardens that are consistent with our hypothesis. In the following sections, we discuss the results in relation to three relevant theories on aesthetics, and thereby examine the causal process in which the spatial feelings create the aesthetic experience of Zen gardens.

**Berlyne’s Theory of Aesthetics**

Berlyne (1971) developed a theory of aesthetics from the perspective of motivations for exploring information. According to Berlyne’s theory, “collative” properties (e.g., complexity and novelty) of stimulus patterns generate a “hedonic value” (e.g., pleasuness and interestingness), while a variable called “arousal potential” intervenes in this process. In Berlyne’s experiments, for instance, both complexity and novelty monotonically raised interestingness, which was considered to be dependent on observers’ degree of arousal (e.g., Berlyne, 1974). Our results show that interestingness has a negative correlation with naturalness, as well as a positive correlation with complexity (Figure 4a). By applying Berlyne’s theory, our findings suggest that complex and artificial designs increase Zen gardens’ interestingness by causing observers’ arousal levels to rise.

**Russell’s Theory of Affect**

Russell (1980) constructed a circumplex model to represent the structure of affect in a spatial manner. Later, this model was also applied to “affective appraisals” of environments (e.g., Russell, 1988). As illustrated in Figure 5, various affective qualities were arranged in a circle with reference to the two axes (although Figure 5 shows the positions of only eight affective states for the sake of simplicity). The horizontal and vertical axes—that is, the two independent dimensions—indicate the degrees of pleasantness and arousal, respectively. According to this model, interestingness and calmness are both high in relation to pleasantness, whereas they are respectively high and low in terms of arousal. On the other hand, Figure 4a and 4b show that interestingness increases with complexity and decreases with naturalness, and vice versa for calmness. These results, consistent with the above discussion about Berlyne’s (1971) theory, suggest that observers’ arousal is increased by complexity and decreased by naturalness.

**Appleton’s Theory of Landscape Preference**

Appleton (1996), a geographer, proposed a theory on the aesthetic preference for landscapes—the prospect-refuge theory. This theory states that people prefer an environment that provides opportunities to see and hide from other places (i.e., “prospect” and “refuge,” respectively), because such a situation is beneficial for animals to survive. Our results indicate that calmness is also associated with the feeling of enclosure (Figure 4b). This finding suggests that the environmental enclosure of Zen gardens produces the effect of a refuge, and thereby provides a feeling of calmness to observers. Considering the fact that a refuge satisfies a biological need to prevent enemies from attacking, it is probable that environmental enclosure enhances calmness by reducing the degree of arousal.

**Conclusion**

The findings of this study support our hypothesis that the aesthetics of Japanese Zen gardens arise from a combination of multiple spatial feelings. In addition, we discussed the results in terms of three theories on aesthetics proposed by Berlyne (1971), Russell (1980), and Appleton (1996), and accordingly suggested that the aesthetic experience is closely related to observers’ arousal. In future work, more detailed analyses should be conducted regarding the relation between the distinctive design style and aesthetics of Zen gardens. According to Berlyne, a moderate level of arousal potential generates the most positive hedonic value. In view of this theory, we speculate that although popular Zen gardens vary in terms of complexity and naturalness, their exquisite design may be intended to cause a certain degree of arousal overall.

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**References**


The Role of Imagery and Indeterminacy in Aesthetic Experiences of Literature

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Abstract

Both mental imagery and the level of detail of literary passages have been hypothesized to play a role in people’s aesthetic experiences; however, it is unclear how these concepts are related. Rich detail prescribes a specific way a stimulus can be imagined while lack of detail, or indeterminacy, allows a participant to fill in missing information with self-generated detail. Literature is a unique way to study aesthetics because the imagery it evokes is of a different form than the stimulus itself (text) unlike, for example, visual imagery evoked while looking at artwork. This dissociation allows the role of imagery in aesthetic experience to be studied independently of confounding sensory input. To study the relationship between imagery, indeterminacy, and aesthetic response, we asked participants to read literary passages and rate each of these measures. We found that the degree of vivid imagery primarily affects aesthetic response.

Keywords: aesthetics; indeterminacy; literature.

Introduction

Literature can be a source of pleasure and of moving aesthetic experiences: a literary text can make us laugh, move us to tears, and can be experienced as beautiful or even inspiring. What components of literature are involved in evoking aesthetic experience? As people read, they use their knowledge of a language’s words and rules of syntax to extract the meaning of the words on a page. With a literary text, readers also employ their knowledge about literary genre, cultural context and social life to understand the text more than denotative information, but as a work of art. Many readers also produce mental imagery as they read, which is thought to involve the activation of mental representations that share similarities to perceptions (Kosslyn, Thompson, & Ganis 2006) and may even involve some of the same neural structures (Farah 2003). Reading the words on a page activates abstract concepts which are then fleshed out into lively imaginary worlds using the brain’s perceptual machinery.

One simple hypothesis for how literature produces moving aesthetic experiences is that passages that evoke stronger mental images are more aesthetically moving (Starr 2013). In this experiment, we tested this hypothesis using a set of literary passages. However, a central concern with this hypothesis is that vivid imagery can be evoked in a number of different ways.

Imagery can be evoked both by richly descriptive text or by “indeterminate” or ambiguous text that lacks specific detail but that leaves room for the reader to fill in missing information with details of their own creation (i.e. to “read between the lines”). For example, imagine reading a scene in which a student meets with her professor in his office. The image of the office evoked by this scene might consist of a bookshelf, a desk with messy piles of paper, and perhaps even a man with glasses. None of those details were given, but the reader constructs a situational or mental model of the scene by including his or her own world knowledge in his interpretation of the explicit detail, thus filling in the missing information in order to comprehend the scene (Bower & Morrow, 1990; Graesser, Singer, & Trabasso, 1994; Zwaan & Radinsky, 1998).

The relationship between indeterminacy and imagery during engagement with aesthetic objects such as literary texts or visual artworks is unclear. On the one hand, aesthetic objects with finely crafted intricate details can produce strong aesthetic experiences (e.g. the complex descriptions of nineteenth-century realist novels). High levels of description in text can provide a specific set of instructions for how the reader may imagine or interpret the scene, and this can create vivid imagery.

On the other hand, it would seem clear that detailed description alone, in the absence of imagery, is not sufficient to evoke a moving aesthetic experience (e.g. reading a recipe or a list of car parts). In fact, several authors have highlighted the importance of ambiguity for aesthetic experiences, arguing that aesthetic objects that allow for multiple interpretations or that leave something unspecified allow for a degree of “mental play” and pleasure akin to solving a puzzle (Iser 1980; Gombrich 2000). In literary texts, a lack of description can also produce a vivid experience of imagery by allowing the reader’s imagination to fill in the gap left by lack of detail. In fact, a study that compared representational visual artworks with
“indeterminate” versions of the same paintings found that the lack of identifiable objects did not alter observers’ average aesthetic ratings, and that observers continued to report the presence of objects in the modified paintings (Ishai, Fairhall & Pepperell 2007).

Is there a direct relationship between the level of detail specified (or left unspecified) in a literary text and a reader’s aesthetic experience of that text? We hypothesized that indeterminacy alone is not a sufficient criterion for evoking a moving aesthetic experience, and that the degree of imagery evoked, either as a result of rich detail or of indeterminate text, allowing mental “filling in,” will be more directly related to the amount of aesthetic pleasure an observer derives from reading a literary text. To test this, we compiled 100 literary passages from short stories and novels varying in style, genre, and date of publication and asked participants to rate the passages on three experimental measures (vividness, descriptiveness, and aesthetic response). These subjective ratings were compared against objective measures of text complexity and level of description, and tested for variance and individual differences among participant ratings.

Method

Participants

Twenty native English speakers with normal or corrected vision were recruited (12 female; 20 right-handed) and paid for their participation. The mean age was 23.6 ($SD = 2.84$). Informed consent was obtained from all participants, in accordance with the New York University Committee on Activities Involving Human Subjects. Participants filled out a background questionnaire from which we determined that expertise and exposure to art varied from “no formal training” to an “MFA in creative arts therapy” and “BFA in musical theatre.”

Stimuli

One hundred literary passages ranging in year of publication from 1781 to 2012 and length from 58 to 307 words ($M = 153.76$, $SD = 49.89$) were selected from short stories and novels written between the late 18$^{th}$ and early 21$^{st}$ centuries. Character names and other highly identifiable proper nouns were modified to help prevent recognition of the passages. Stimuli were displayed on a 21.5-inch LED-backlit iMac monitor in Courier font on a light-grey background using Matlab 8.1 and the Psychophysics Toolbox (Brainard 1997). The monitor was positioned 57 cm away from the participant and the text was font size 24. Each participant viewed 20 of the 100 passages, randomly ordered such that every five participants completed the full set of 100 stimuli.

Measures of reading level were computed using the Flesch-Kincaid method, a reliable and widely used formula that calculates the minimal grade level required to read and understand the text (Flesch, 1948; Kincaid, Fishburne, Rogers, & Chissom, 1975; Paasche-Orlow, Taylor, & Brancati, 2003). An objective measure of “descriptiveness” (the inverse of indeterminacy), was calculated by computing the ratio of adjectives, adverbs, and nouns to the total number of words in each passage and multiplying this ratio by each passage’s Flesch–Kincaid score. The Flesch–Kincaid formula takes into account the number of syllables per word (Si & Callan, 2001), which we used as a basic weighting system for the complexity of words. By multiplying the ratio of descriptive words in a passage by their Flesch-Kincaid scores, we were able to take into account the tendency for longer words to be more descriptive.

Procedure

Participants read and signed the consent form then filled out a background questionnaire. They were then shown instructions indicating that they would be reading a set of literary passages and quantifying them on several measures across three blocks. The participants were given several practice trials before beginning the task. For each subsequent block, specific instructions were given on the rating measure for that block.

In the first two blocks, participants were instructed to rate each passage on degrees of vividness and description. Block order was counterbalanced across participants. The third block always asked the participants to rate their aesthetic responses. Aesthetic responses were probed last in order to prevent aesthetic ratings from influencing the vividness and descriptiveness ratings. The instructions informed the participants about which measure they would be quantifying in that block with a definition and example. Vividness was defined as “the degree of sensory imagery (whether sight, sound, touch, taste, or smell) that is evoked by the passage.” Descriptiveness was defined as “the degree of specific detail that is presented by the passage.” For aesthetic response measures, participants were asked to imagine they were helping choose literary passages for a “Best Works” anthology. They were asked to rate each passage on their gut-level responses to the question “How much did this passage move you?” Each measure was rated on a 1 (Low) – 7 (High) scale.

After the instructions and practice trials, the experimenter left the room and participants began the experiment. Participants clicked the mouse to indicate they were ready to start each new trial, after which a passage was presented on the screen. Participants clicked the mouse to indicate that they were finished reading the passage. If, after 2 minutes, the participants had not clicked the mouse, the trial ended. Only a single trial ended this way. After each passage was removed from the screen, participants were shown a question (e.g. “How vivid is the imagery evoked from this passage?”) and indicated their response by clicking a numbered button (1 – 7). Each participant read 20 passages, which were randomized as described above. Additionally, the 20 passages were randomized between blocks to control for order effects. At the end of the third block, the experimenter returned and participants completed the revised Vividness of Visual Imagery Questionnaire (VVIQ-2) which measures individual visual imagery ability (Marks
Upon completion, participants were paid and asked if they had recognized any passages. Three participants recognized a total of 4 passages; two were identified by name of work and two were recognized as familiar but not by work or author. These passages were not removed from further analyses.

Results

Stimulus Characteristics

Reading level ranged from a Flesch-Kincaid score of 2.4 to 25.2 ($M = 9.65, SD = 4.39$). The average “objective” level of description (see Methods) was 3.65 ($SD = 1.99$). There was not a significant correlation between the objective descriptiveness rating and the average participant ratings of descriptiveness for each passage ($r(98) = .08, p = .41$). The objective descriptiveness rating was, however, significantly correlated with participants’ aesthetic response ratings ($r(98) = -.27, p < .01$).

To investigate the discrepancies between the objective descriptiveness measure and participant descriptiveness ratings, we computed individual subject-level regressions (Fig. 1) to determine how much individual participants’ descriptiveness ratings were predicted by the objective stimulus characteristics (reading level, word count, year of publication, and the objective descriptiveness measure). Participant ratings of descriptiveness were not well captured by objective stimulus characteristics (average $R^2 = .25$). Even for those participants whose descriptiveness ratings were significantly predicted by some combination of stimulus characteristics, there was no consistency in which characteristic was predictive.

Participant Ratings

The total viewing time for each trial was calculated and plotted for each block to determine any invalid trials. Based on the distributions of view times for Block 1 ($M = 38.54s, SD = 18.36s$), a conservative 3 second criterion was selected as an absolute minimum amount of time within which a participant could be expected to read even the shortest passage, on a first viewing. Two trials were identified with viewing times below 3 seconds and determined to be invalid trials. For Block 2 ($M = 26.89s, SD = 16.60s$), an even more conservative cutoff of one second was selected as a minimum amount of time a participant could be expected to read a passage on its second viewing. Two trials were identified that had viewing times below one second, and were therefore also determined to be invalid trials. There were no trials identified as invalid for Block 3 ($M = 22.90s, SD = 16.58s$). These four invalid trials were removed from further analyses.

When collapsed across all participants, mean ratings of vividness ($M = 4.87, SD = 1.72$), descriptiveness ($M = 4.74, SD = 1.77$), and aesthetic response ($M = 4.50, SD = 1.85$) did not differ, $F(2, 54) = 2.05, p = .14$.

For the group-averaged data, we found that vividness was significantly correlated with descriptiveness ($r(98) = .23, p = .02; \text{Fig. 2A}$) and with aesthetic response ($r(98) = .25, p = .01; \text{Fig. 2B}$). There was no relationship between descriptiveness and aesthetic response ($r(98) = .03, p = .76; \text{Fig. 2C}$).

Figure 2: The amount of vivid imagery, but not the degree of indeterminacy, is correlated with aesthetic appreciation. (A) Vividness and descriptiveness are mildly positively correlated ($r = .23$); (B) Vividness and aesthetic response are also mildly correlated ($r = .25$); (C) However, descriptiveness and aesthetic response show no correlation ($r = .03$).
We performed a regression to predict individual participants’ aesthetic responses from their ratings of vividness, descriptiveness, and the objective stimulus measures. Overall, individual subject-level regressions (Fig. 3) were able to account for an average of 46.3% of the variance in aesthetic response ratings. For 60% of participants, the standardized beta for vividness ratings was weighted positively, indicating that the majority of participants who rated passages higher on vividness levels tended to also rate those passages higher on aesthetic response levels.

Inter-Rater Agreement and Item-Level Analysis

Passages were assessed for inter-rater agreement for ratings of vividness, descriptiveness, and aesthetic response using a two-way random effect model for the intraclass correlation (ICC[2,1]; Shrout & Fleiss, 1979). The results showed statistically significant but very low agreement for ratings of vividness (ICC[2,1] = .09, p = .01) and descriptiveness (ICC[2,1] = .08, p = .02), and moderate agreement for ratings of aesthetic response (ICC[2,1] = .30, p < .001).

On an item-level, we computed the standard deviation of the ratings for each passage, for each measure. Across all 100 passages, the mean standard deviation of the vividness ratings was 1.53 (SD = 0.62), for descriptiveness (M = 1.62, SD = 0.60), and aesthetic response (M = 1.46, SD = 0.63). Interestingly, there were no group differences based on imagery ability (F(1, 54) = 0.34, p = .56), and imagery ability was not a predictor of individuals’ ratings of vividness (β = -0.09, t(19) = -0.35, p = .74).

Order Effects

Half of the participants rated vividness in Block 1 and descriptiveness in Block 2, while the other half of the participants rated their passages in the reverse order. We performed a linear regression for each group, with participants entered as a random effect, to test whether vividness ratings can be predicted by descriptiveness ratings when the descriptiveness judgment preceded the vividness judgment. When vividness was rated first, the two factors accounted for 14.0% of the variance, R² = .14, F(2, 197) = 15.87, p < .001, and descriptiveness ratings significantly predicted vividness ratings, β = 0.37, t(197) = 5.51, p < .001. When vividness was rated second, however, these factors only accounted for 1.0% of the variance, R² = .01, F(2, 197) = 0.98, p = .38, and descriptiveness ratings were not a predictor of vividness ratings, β = 0.06, t(197) = 0.81, p = .42.

Discussion

The aim of this study was to explore the relationship between mental imagery, indeterminacy, and the aesthetic response evoked from literary passages. Although participants’ ratings showed that indeterminate stimuli could be experienced as aesthetically pleasing, it was the vividness of the evoked imagery, regardless of the level of description, that influenced an individual’s aesthetic response. Our analyses support our hypothesis that aesthetic response is more directly determined by imagery, but that indeterminacy can play a role in helping or hindering imagery production. This relationship supports the view that mental images evoked by literature play a key role in aesthetic experience (Starr 2013).

Although there was a significant relationship between group-averaged vividness ratings and group-averaged aesthetic responses, subject-level analyses revealed strong individual differences in participants’ ratings. Participants varied greatly on their use of the rating scale, which we have seen in other studies (Vessel, Starr, & Rubin, 2012; Vessel, Stahl, Maurer, Denker, & Starr, 2014). The subject-level regression analyses also revealed that the predictive variables for aesthetic response ratings varied among individuals: for some participants, vividness ratings significantly predicted their aesthetic responses, while for others, descriptiveness ratings significantly predicted aesthetic responses. The analysis of order effects, however, may point towards a conflation of the vividness and descriptiveness concepts when vividness was rated first. It is possible that rating descriptiveness in the first block allowed participants to better understand the difference between
The brick was in his hand. In his mind his hand traced a quick invisible arc through the cold air of the room; high above his head his hand paused in fancy and imaginatively swooped down to where he thought her head must be. He was rigid; not moving. This was the way it had to be. Then he took a deep breath and his hand gripped the brick and shot upward and paused a second and then plunged downward through the darkness to the accompaniment of a deep short grunt from his chest and landed with a thud. Yes! There was a dull gasp of surprise, than a moan. No, that must not be! He lifted the brick again and again, until in falling it struck a sodden mass that gave softly but stoutly to each landing blow. Soon he seemed to be striking a wet wad of cotton, of some damp substance whose only life was the jarring of the brick's impact.

Vividness = 6.50 ± 1.00  
Descriptiveness = 3.25 ± 2.63

A man and a woman sail into the mists and lose themselves in a formless new world where nobody knows them. In all the world where they have only each other and the servant girl. The man is a servant too, the servant of beauty, and the name of his journey is love. They arrive in a place whose name does not matter just as their names do not. The years pass and their hopes die. All around them are energetic men. A wild world to the south and another to the north are slowly, slowly being tamed.

Vividness = 2.00 ± 0.82  
Descriptiveness = 2.50 ± 1.91

She was a blonde, with hair combed high in an odd style for a girl her age, and a light blue dress which was also too grown up; its skirt, as it rose with the swing, was swirling with lace petticoats. The girl had her eyes half closed and her nose in the air as if used to playing the lady, and she was eating an apple in little bites, bending her head down toward her hand, which had to hold the apple and balance her on the rope of the swing at the same time; and every time the swing reached the lowest point of its flight she would give herself little pushes on the ground with the end of her tiny shoes, blow out bits of apple peel and sing... as if she cared neither for the swing, nor the song, nor (though perhaps a little more) for the apple, and had other things on her mind.

Vividness = 6.00 ± 0.00  
Descriptiveness = 6.50 ± 0.58

The decks were quiet and clean; one cargo had just been delivered, part of another stood ready on the levee to be shipped. The captain was there waiting for his business to begin, the clerk was in his office getting his books ready, the voice of the mate could be heard below, mustering the old crew out and a new crew in; for if steamboat crews have a single principle,--and there are those who deny them any,--it is never to shop twice in succession on the same boat. It was too early yet for any but roustabouts, marketers, and church-goers; so early that even the river was still partly mist-covered; only in places could the swift, dark current be seen rolling swiftly along.

Vividness = 2.75 ± 1.71  
Descriptiveness = 5.00 ± 1.41

Figure 4: Literary passages rated high and low on vividness (vertical axis) and descriptiveness (horizontal axis). Reported are the mean ratings and standard deviations

these two measures, and that the inconsistency of predictive measures is a result of this conflation.

The ICC coefficients were statistically significant but the inter-rater agreement for both vividness and descriptiveness were extremely low (i.e. < .1) indicating that this is a case where the magnitude of agreement, rather than its statistical significance, is more informative for rater-agreement. Despite this, about a third of the passages showed high agreement among participants’ ratings. It also appears that our stimulus set is biased toward stimuli of high vividness and high descriptiveness (Fig 2B); however, passages were found with both low- and high- vividness and descriptiveness (Fig. 4).

Our study supports the hypothesis that vivid imagery produces moving aesthetic experiences and that indeterminacy’s effect on aesthetic experience is mediated by the production of imagery. Even for individuals with lower than average imagery ability, imagery is a powerful component of the aesthetic experience of literature, suggesting that the imaginative affects of artworks offers a rich field for further exploration.

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References


The ‘Weight’ of Semantics! Complexity Beyond the Number of Elements

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Abstract

Past research identified complexity as an important variable in the aesthetic appreciation of artworks. Here, we study qualitative aspects of complexity on the level of meaning by using original and altered Magritte paintings. For the latter, semantically or syntactically incoherent objects were moved or replaced to eliminate the incoherence. The quantitative complexity was held constant in both conditions, confirmed by three different image statistic measures (jpeg/gif compression and perimeter detection measure). However, when we asked twenty-two participants to rate the complexity on a 7-point scale, the ambiguous pictures were perceived significantly more complex than the less ambiguous pictures. The ‘complexity of meaning’ might be a reason why ambiguous stimuli are appreciated and ambiguous art is so appealing!

Keywords: aesthetics; quantitative complexity; qualitative complexity; ambiguity

Introduction

It is well-known that visual complexity in images influences aesthetic appreciation. Differences in the relationship between complexity and aesthetic judgments were shown to be due to the multi-dimensional nature of complexity (e.g., Attneave, 1957; Chipman, 1977; Ichikawa, 1985; Nadal, Munar, Marty, & Cela-Conde, 2010). The different dimensions seem to have more or less influence on the perception of complexity. Nadal et al. (2010) showed that the number of elements described most of the data’s variance, followed by the organization of these elements and their (a)symmetry. However, these dimensions represent quantitative parts of complexity; referring to descriptive, visual elements of an image. Complexity beyond visual elements is determined by interpretation, understanding and meaning. In the present study we address this qualitative aspect of complexity and test how ambiguity (semantic incoherence) influences subjective complexity judgments.

Methods

Stimuli and Design

Twenty five pairs of Magritte paintings were presented in this experiment. The pairs represent the two experimental conditions of ambiguity (low versus high ambiguity). Rene Magritte used to place semantically unrelated objects in a scene (semantic incoherence) or let them float in the air (syntactic incoherence). By (re)moving or changing the incoherence altered versions were created (see Figure 1). The pictures of a pair were balanced between participants.

Figure 1: Examples of the two manipulation types (grey areas): A. syntactic change; B. semantic change.

Procedure

Participants were tested individually or in groups of two to four. Each participant signed a written consent form. Then visual acuity and color vision (Ishihara color plates) were measured. Participants received written instructions before the experiment started. The presentation was controlled by the E-Prime experimental software (Schneider, Eschman, & Zuccolotto, 2002) and responses were recorded via keyboard. In the first experimental block, scales for complexity, interestingness, and valence were displayed below each stimulus in random order. After the participants pressed a response key, the next scale appeared or the next stimulus automatically appeared. Each stimulus was presented until all three scales were answered.
Additional measures

In order to validate quantitative aspects of image complexity, three additional measures were used: 1) jpeg and 2) gif compression techniques and 3) a perimeter detection measure (Forsythe et al., 2008; Forsythe et al., 2003; Marin & Leder, 2013).

Results

T-tests for independent samples (participants were only exposed to one of the two picture versions) were performed for the subjective, qualitative ratings as well as the objective, quantitative image parameters.

Subjective, qualitative complexity ratings

Data were sampled over stimuli. The t-test revealed a significant difference between the two experimental conditions, $t(48) = 5.95, p < .001$, Cohen’s $d = 1.72$. Ambiguous pictures ($M = 4.54, SD = .57$) were rated more complex that the non-ambiguous counterparts ($M = 3.43, SD = .74$).

Objective, quantitative complexity measures

Again, independent t-tests were run: In the first analysis, the file format compression rates (.jpg/.gif) from each image file were used as data. In the second analysis the scores calculated from a perimeter edge detection algorithm were imported to SPSS.

Compression rates (jpeg & gif) No significant difference between ambiguous and non-ambiguous images was found, jpeg: $t(48) = 0.17, p = .87$, Cohen’s $d = 0.05$, gif: $t(48) = 0.12, p = .91$, Cohen’s $d = 0.03$.

Perimeter detection measure A similar result as for the compression rates can be reported here as well: $t(48) = 0.01, p = .99$, Cohen’s $d < 0.01$, CI [-.001, .001]

An overview of the present results is shown in Figure 2.

Discussion

The present study provides empirical evidence for the impact of qualitative aspects of complexity like meaning on complexity judgments. We showed that ambiguous pictures were rated significantly more complex than less ambiguous pictures. This while quantitative factors in the picture pairs did not differ. Values of common measures for objective complexity were compared in this respect. No significant differences between the two ambiguity classes were found. The complexity of meaning - representing a qualitative aspect - therefore influences judgments of image complexity significantly.

From previous studies we know that ambiguous images are preferred at longer presentation durations and are perceived as more interesting (Jakesch, Leder, & Forster, 2013). Therefore, we conclude that art is definitely interesting because of the visual, quantitative complexity (for an overview see Nadal, Munar, Marty, & Cela-Conde, 2010), but also because it is semantically challenging on a qualitative level of meaning.

Figure 2: Overview of results (from left to right): jpeg and gif compression, perimeter detection measure and subjective complexity ratings. Significant differences are marked with an asterisk (Error Bars: ±1 SE).
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References


Bach, Escher, and Mental Rotation: An Empirical Study in the Perception of Visual and Melodic Congruency

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Abstract
Among the most fascinating aspects of music are the quasispatial properties of tonal space and structures. For instance, any conventional melody can be visualized as a contour—as a combination of ups and downs. A melodic contour can be “bent” by tonal forces, and all its melodic intervals can be “mirrored.” In addition, a contour can be augmented and diminished in duration, which is conceptually similar to a proportional enlargement and diminution of a visual object. Certain musical compositions, specifically Baroque fugues, resemble divisions of the plane, such as in M. C. Escher’ tessellations and M. K. Čiurlionis’ paintings. When the tonal space of music is visualized as phenomenal gravity (Scruton, 1997), tonal melodies can be explained as melodic objects shaped by the tonal force field. We hypothesized that the cognitive processing of these transformations may draw on spatial abilities developed for visuospatial reasoning and that the perception of melodic transforms involves the same neural substrate in the parietal cortex (specifically BA 7), which is engaged in visuospatial processing. We conducted a behavioral study that compared the perception of congruency of 3D geometrical figures and congruency of tonal melodies. The visuospatial task used a set of stimuli from a study in mental rotation (Shepard and Metzler, 1971), whereas the melodic rotation task used a set of melodies selected from the clavier compositions of J. S. Bach. The same melodies were used for a control task on timbre judgment. Performance was positively correlated for visual and melodic spatial tasks (r = .40), but the pattern of correlations overall differed between sexes. Males performed better than females on all three tasks. The obtained results converge with previous investigations that found gender effect in the visuospatial mental rotation task, and offer new information about gender effect in music perception. The discovery of a positive correlation between melodic and visual spatial tasks provides supporting evidence for the hypothesis of supramodal processing in music perception and inspires new directions for discussing the aesthetic experience.

Keywords: music perception, supramodal processing, mental rotation, melodic transformation, gender effects

Introduction
Music is essentially intuitive and sensual. Yet one of the most interesting subjects of advanced music training is analysis of musical form, the purpose of which is to teach musicians how to recognize and examine musical architectonics. Analysis of musical form uses extensively spatial concepts. Music—a subjective and abstract art—has a high degree of structural order. Music compositions are made of tones arranged in time, and music’s two main dimensions are tonal space and structured time. The tonal and temporal dimensions are inseparable and together they create the unity of a musical structure—the tonal chronotope.

The easiest way to explain the tonal dimension is by comparing the tonal space of music to the gravitational field. A musical scale is a system of reference for our mind to read tonal patterns. In a scale, the tones are organized hierarchically: the first note of a scale (tonic or tonal center) is a depression of potential tonal energy and all other tones differ in the intensity of their attraction to the tonal center. The difference in degree of attraction (not just difference in pitch) is the source of melodic patterns—the source of music, as we know it today. Explaining music in terms of phenomenal gravity (Scruton, 1997) leads to thinking about melodies as objects shaped by the power lines of a force field of tonal attraction. For the ear, transformation of a melody is akin to transformation of a material object for the eye. In polyphonic music, and sometimes in thematic development of sonata allegro form, a melody serves as a “constructing unit” (module) that can be augmented, diminished, bent, or mirrored (Fig. 1). A catalog of visuospatial transformations (Shepard and Cooper, 1982) can be compared point by point to a catalog of melodic transformations used in polyphonic technique.

Figure 1. Melodic transformation: Two-Part Invention in C, J. S. Bach. Melodic theme and its “translation” (white arrows), “mirroring” (black arrows), and “augmentation” of the theme’s beginning fragment (striped arrows)

Figure 2: Another World, M. C. Escher. Image of two windows, with a bird and a horn, serves as a “constructing unit” for the overall composition (Wikipedia, fair use)
The best visual illustrations for module-based musical structures can be found in the works of M. C. Escher. (In one of his letters, Escher mentioned the paradoxical similarity between the division of the plane in visual art and division of time in music). For instance, the woodcut print Another World is built on a visual module made of two windows: one window with a bird and another window with a horn (Fig. 2). The module is seen from three different perspectives: from below, opposite, and from above. Our perception is played with by the appearance of the images from different angles of view.

People’s ability to recognize the same object when it is shown from different angles of view was explored in a famous study in mental rotation by Shepard and Metzler (1971). The researchers used a large set of drawings of 3D geometrical figures arranged by pairs; in each pair, one of the objects was rotated in relation to another (Fig. 3). The results of the study confirmed the author’s main hypothesis that the greater the angle of rotation, the longer it takes to make a judgment on whether the two 3D objects are congruent or not.

Figure 3: Samples of stimuli for two trials from a study in mental rotation (after Shepard and Metzler, 1971; Wikimedia Commons, by Jennifer Oneske)

Empirical research shows that melodies are remembered in terms of their shape, or melodic contour, and that by using the standard melody as a template, people are able to recognize the transformation of a contour (Dowling, 1972, 1978). For example, a melodic contour seems “bent” when some of a melody’s constituent intervals change in size, and the melodic contour becomes “mirrored” when all the intervals change direction (Fig. 4).

Figure 4: Transformation of a melodic contour from Two-part Invention in C major by J. S. Bach

Musicians liberally apply spatial terminology in musicology and in teaching music to students at all levels. For a highly trained performer contemplating a complex musical composition, music is often sensed as a balance between the tonal shapes that comprise the main melodic themes, and melodic arches (connecting material). At some point, the performer can sense the whole composition “at once,” in all its architectural clarity and as if beyond the constraint of the temporal dimension.

It is possible that musicians may differ from non-musicians in visuospatial reasoning. For example, musicians perform better on tests of spatial perception than non-musicians (Hassler, 1992), and musicians differ from non-musicians in the pattern of brain activation when performing Shepard & Metzler’s mental rotation task (Bhattacharya et al, 2001). Listening to melodic transformations involving transposition and retrograde presentation generates activation in those parietal areas that are involved in visuospatial processing, including mental rotation (Jordan et al, 2001; Harris & Miniussi, 2003; Zatorre et al, 2009; Foster & Zatorre, 2010). In comparison with non-musicians, the brains of professional male keyboard players show increased gray matter volume in several areas of the cortex, including the superior parietal lobe that is important for visuospatial reasoning (Gaser & Schlaug, 2003).

Brain imaging studies also point to the possibility of sex differences in the performance of melodic transformation and visuospatial tasks. Males generally perform better on mental rotation tasks than females (Voyer et al, 1995; Maeda & Yoon, 2014), and this advantage has been explained by the involvement of sex hormones (Hassler & Nieschlag, 1989; Peters et al, 2007) and by regional morphological differences between male and female brains (Koscik et al, 2009; Ardekani et al, 2013). These previous studies suggest the possibility of a relationship between performance on a mental rotation task and melodic transformation task, although an attempt at comparing the performance on mental rotation of 3D objects with performance on transformation of random sequences of tones (Cupchik et al, 2001) produced a rather puzzling pattern of results, which was due, most likely, to the absence of conventional melodic shapes.

We hypothesized that the melodic transformation task and visuospatial mental rotation task should be positively correlated and that the musical experience should be positively correlated with both of these tasks. To test our hypotheses, we conducted a behavioral study that compared performance on the perception of congruency of 3D geometrical figures and tonal melodies.

**Method**

Two-hundred-thirty-one undergraduates of the University of Texas at Dallas, 163 females (ages 18 – 54 with a mean of 24.64, SD = 6.44) and 68 males (ages 18 – 65 with a mean 25.99, SD = 8.34) participated in the experiment in partial fulfillment their course requirements in psychology. All 231 participants performed the melodic contour transformation and visuospatial tests, whereas 114 of them (82 females and 32 males, ages 18 – 38 with a mean of 24.75, SD = 5.74) in addition performed the control task on timbre change recognition. Participants who had 4 or more years of musical experience were characterized as musically experienced.
The visuospatial task was a shortened replica of the classic Shepard and Metzler’ experiment in mental rotation, and was composed of 122 pairs of images of 3D geometric objects (Fig. 3). The images were presented to the participants as a PowerPoint slide presentation. Duration of each stimulus was 3 seconds; the stimuli were divided by a 3-second gap, during which the participants made the judgment on congruency.

The auditory tasks included the main task on melodic contour transformation and the control task on timbre change. The main task of melodic rotation was designed as a musical counterpart of the visuospatial mental rotation task and consisted of a set of 27 melodies in their standard and altered form that presented melodically congruent and non-congruent transforms. The melodies and their transforms (one transform for each melody) were selected from the clavier compositions of J. S. Bach and recorded on CD with a grand piano. The melodies were 7 to 16 notes long, relatively balanced in mode (major-minor), balanced in meter (duple versus triple), and differed in tempo and character. On each trial, a melody was followed, after a pause of 2 seconds, by its transformed version. Melodic contour transformations included three categories: Mirrored, Bent, and Composite (Fig. 5).

Table 1: Correlations among the visual and melodic tasks and musical experience for all 231 participants

<table>
<thead>
<tr>
<th>All participants</th>
<th>Visual</th>
<th>Melody</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experience</td>
<td>0.12</td>
<td>0.40***</td>
</tr>
<tr>
<td>Visual</td>
<td>0.40***</td>
<td></td>
</tr>
<tr>
<td>Male participants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experience</td>
<td>0.07</td>
<td>0.33**</td>
</tr>
<tr>
<td>Visual</td>
<td>0.28**</td>
<td></td>
</tr>
<tr>
<td>Female participants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experience</td>
<td>.10</td>
<td>0.42***</td>
</tr>
<tr>
<td>Visual</td>
<td>0.39***</td>
<td></td>
</tr>
</tbody>
</table>

*** p < .001; ** p < .01; * p < .05

For those 114 participants who performed all three tasks (including control task on timbre recognition) the visuospatial and melodic transformation tasks were correlated, \( r = .40, p < .001 \). Musical experience was correlated with the melodic transformation task, \( r = .40, p < .001 \), but not with the visual-spatial task. A similar pattern of correlations was obtained for men and women independently (see Table 1).

![Figure 5: Transformation of melodic contour: Minuet from “Notebook of Anna-Magdalena Bach”](image)

In Mirrored transforms all melodic intervals of a contour reversed their direction. In Bent transforms, some melodic intervals of a contour changed in size, but because the relative pitch-direction of the intervals was preserved, this made Bent transforms congruent with the original form. Altering the size of the melodic intervals made the melodic contour “bent,” which was conceptually similar to the visual effect observed in mental rotation when the sides of the cubes of a geometric object appeared shortened or lengthened in size due to a change in the viewing angle (Fig. 3). Composite transforms had only some of their melodic intervals reversed in direction; because of non-systematic changes. Composite transforms represented melodic non-congruency. For all melodic stimuli, the temporal organization of a melody and of its corresponding transform was identical. The same 27 original melodies were used in the control task where participants made judgment on how many tones in a sequence were different in timbre from the other tones: 1, 2, or 3. Cakewalk software was used to control the change of timbre from piano to harpsichord. The acoustically oriented (non-spatial) perception of individual tones did not involve an integrated perception of melodies as compared to the quasispatial perception of the melodic objects in the main musical task.

Results

For all 231 participants, the visuospatial and melodic transformation tasks were correlated, \( r = .40, p < .001 \). Musical experience was correlated with the melodic transformation task, \( r = .40, p < .001 \), but not with the visual-spatial task. A similar pattern of correlations was obtained for men and women independently (see Table 1).
tasks, \( r = .30, p < .01 \); between the melodic transformation task and the timbral task, \( r = .24, p < .05 \); and between the melodic transformation task and experience, \( r = .48, p < .001 \). Therefore there was a very a specific correlation of the visual and melodic transformation tasks for males, and a more general pattern of correlations among the various tasks for females. A repeated measures ANOVA for males showed a main effect of experience for the melodic and visual tasks, but not for the timbral task. In comparison, a repeated measures ANOVA for females revealed a main effect of experience for the melodic and timbral task but not for the visual task. The results of MANOVA showed a significant effect of music experience for females only (\( p < .001 \)).

### Table 2: Correlations among the visual and melodic tasks and musical experience for the 114 participants who did all three tasks including the timbral task.

<table>
<thead>
<tr>
<th>All participants</th>
<th>Visual</th>
<th>Melody</th>
<th>Timbre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experience</td>
<td>0.15</td>
<td>0.41***</td>
<td>0.17</td>
</tr>
<tr>
<td>Visual</td>
<td>0.37***</td>
<td>0.33***</td>
<td></td>
</tr>
<tr>
<td>Melody</td>
<td></td>
<td>0.27***</td>
<td></td>
</tr>
<tr>
<td>Male participants</td>
<td>Visual</td>
<td>Melody</td>
<td>Timbre</td>
</tr>
<tr>
<td>Experience</td>
<td>0.34</td>
<td>0.31</td>
<td>0.06</td>
</tr>
<tr>
<td>Visual</td>
<td>0.46**</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>Melody</td>
<td></td>
<td>0.19</td>
<td></td>
</tr>
<tr>
<td>Female participants</td>
<td>Visual</td>
<td>Melody</td>
<td>Timbre</td>
</tr>
<tr>
<td>Experience</td>
<td>0.12</td>
<td>0.48***</td>
<td>0.20</td>
</tr>
<tr>
<td>Visual</td>
<td>0.28**</td>
<td>0.30**</td>
<td></td>
</tr>
<tr>
<td>Melody</td>
<td></td>
<td>0.24*</td>
<td></td>
</tr>
</tbody>
</table>

*** \( p < .001 \); ** \( p < .01 \); * \( p < .05 \)

## Discussion

The results of our study confirmed the predicted positive correlation between the melodic rotation task and visuospatial task, though the study did not find that music experience was important for visuospatial reasoning (see Tables 1 & 2). The positive correlation between the two modality-different tasks, visual and auditory, could be interpreted as a manifestation of supramodal processing, meaning that the perception of coherent melodic images and their transforms transcends modality of sensory information. In broader reading, this hypothesis implies that gestalt might be supramodal generally.

The hypothesis of supramodality is in accord with Alexander Luria’s (1973) model of functional hierarchy of the brain, in which the secondary and tertiary cortical zones of the brain perform an “integrative role...which is necessary for more complex gnostic processes” (Luria, 1973, p. 77). Therefore, Luria’s model proposes that with an increase in complexity of the gnostic processes—and with ascent in functional hierarchy—cognitive mechanisms become less modality specific.

Considering that music is not essential for survival of the species, it is reasonable to suggest that music engages cognitive mechanisms that were finessed by evolution for survival-oriented purposes. The available data (and philosophic discourse on the aesthetic of music) lead to the conjecture that visuospatial processing and the perception of melodic transforms engage common cognitive mechanism and share the same neural substrate in the parietal lobe (specifically BA7). The neurobiological aspect of the hypothesis of supramodality relies on neuroimaging studies in musicianship-related plasticity (Gaser & Schlaug, 2003; Wan & Schlaug, 2010) and on research in mental rotation (Bhattacharya et al, 2001) and melodic contour transformation (Dowling, 1972), whereas the philosophical foundation of the hypothesis relies on the works of Florensky (1925), Scruton (1997), and Prigogine (1997). The crucial musical aspect of the hypothesis of supramodality is the resemblance of tonal space to the gravitational field.

Listeners perceive tonal space as a hierarchy of perceived tonal tension (Krumhansl & Kessler, 1982; Fredrickson, 1995). Perceived tension is intimately related to the perception of consonant and dissonant compounds, which, in turn, might be related to the cost of neuronal auditory processing. For example, the consonant Pythagorean intervals and major triad differ from the dissonant intervals and triads by the amount of shared spectral information: the greater overlap of the beginning overtones in the harmonic series of tones, the more consonant the combination of the tones and the simpler the ratio of frequencies of the tones.

Where the real gravitational field is an absolute physical phenomenon, a tonal force field is a mental construct that springs as a mental system of reference as soon as the human mind detects homogeneous perceptual elements (tones) and attempts to construct a coherent melodic entity. Artfully arranged tonal interactions within the force field of phenomenal tonal gravity generate melodic topology that is perceived as music: for instance, as a melody. When a melody changes its position along a scale, this can produce changes in melody’s shape, which are reminiscent of the transformation of living forms as illustrated by D’Arcy Thompson (1917).

In the presented study we found a significant positive correlation between the quasispatial melodic task and the visuospatial task, which suggests that both tasks might be relying on the same processing resources in the brain, even if the tasks belong to different domains: tonal time-space, two-dimensional and cyclical, versus 3-dimensional visual space. The results indicate that men possess a specific cortical network dedicated to processing mental rotation, whereas women engage additional, more general, cognitive resources (Ecker et al, 2006). The gender effects in performing mental rotation tasks have been explained in terms of a neurobiological basis that involves sex hormones (Hassler & Nieschlag, 1989; Haumann et al, 2000; Hooven et al, 2004; Peters et al, 2007), and as a result of “specific adaption” for
mental rotation in the parietal lobe of men as compared to women (Kosciel, et al, 2009). Overall, the evidence suggests that visuospatial reasoning and melodic processing might engage different strategies and even different cognitive mechanisms in females as compared to males (Good et al, 2001; Tcheang et al, 2013). We also found that some participants with no formal musical training showed excellent performance both on the visuospatial task and quasispatial melodic task, as if the difference in modality of the two systems of reference—visual and tonal—did not matter for these participants. Therefore, it is quite possible that our study tested fluid intelligence—inborn abilities for pattern recognition and inductive and deductive reasoning (Choi et al, 2005).

The presented behavioral study could not answer the question of whether there is actual involvement of a shared neural substrate in processing visuospatial mental rotations and melodic transformations, but recent neuroimaging studies offer evidences suggesting that this is the case (Foster & Zatorre, 2010). However, we cannot exclude the competing explanation: that the activation of the parietal cortices is related rather to maintaining cognitive control (Coul & Frith, 1998; Cusack, 2005; Husain & Nachev, 2007) than to spatial processing proper, regardless of whether the stimuli are auditory or visual.

**Conclusion**

The main concept of the presented study reflects on the performing experience of a classical pianist. This experience is saturated with an awareness of the quasispatial nature of complex musical structures. The Weimar poets’ famous definition of architecture as “frozen music” has been universally accepted as a metaphor, yet it is not implausible that, for the human mind, music is indeed sonic architecture in motion or proportions in motion. The hypothesis of the gradient of neuronal cost of auditory processing (which is still in want of direct empirical conformation) suggests that the psychophysics of melodic compounds depends on the amount of important shared information in the harmonic series of tones that make the compounds. This approach gives specific rationale for Leibniz’ motto that music is unconscious calculation.

Thinking about the foundations of music perception as an intuitive reaction to artful sequences of sonic proportions in the phenomenal tonal field inspires new kinds of studies in aesthetic emotion. For example, the neuroimaging investigation of brain responses to changes in proportions in masterpiece sculptures (Di Dio et al, 2007) can be complemented with a study of brain responses to conceptually similar changes in the “proportions” of melodies. In addition, an interdisciplinary cooperation between artists, psychologists, and mathematicians could lead to formalization of the topology of melodic structures and creation of multimedia installations where music could be faithfully visualized with the data from the research in quasi-synaesthetic responses to distances in tonal space (Korsakova-Kreyn & Dowling, 2014). The area of empirical research in the quasispatial properties of music is still in its infancy, and it is possible that new studies focused on comparing visual and musical images could enhance our understanding of the aesthetic experience.

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Ascending/Descending Melodic Interval Asymmetry in Arnold Schoenberg’s Vocal Music: Implications for Trans-historical Creativity

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Abstract
Archival studies of tonal music have revealed an asymmetry whereby ascending melodic intervals tend to be larger than descending intervals. The cross-cultural pervasiveness of this asymmetry begs the question of to what extent this tendency may operate as an implicit constraint on composers. To examine the generality of this tendency even in the face of overt rebellion against musical tradition, here we coded 13,705 melodic intervals in 97 vocal works by iconoclastic modernist composer Arnold Schoenberg, whose music departs strongly from traditional Western tonality. Results indicate that, despite Schoenberg’s many innovations, his vocal music preserves (and moreover, exaggerates) the usual asymmetrical pattern of ascending leaps and descending steps. Results are discussed in the context of psychological theories of trans-historical change in the arts.

Keywords: classical music, Arnold Schoenberg, melody, trans-historical creativity.

Introduction
The issue of how artistic styles evolve over the generations, an area of study pioneered by Martindale (1975, 1990), is rife with unanswered questions. How, and along how many dimensions, do artistic styles systematically change over time? What metrics can be used to assess trans-historical stylistic evolution? As an artistic domain or style develops, which ‘rules’ are flexible – or not – and why?

Martindale’s own research, building on the seminal work of Berlyne (1971), suggest a strong psycho-biological foundation for human aesthetics, rooted in well-established principles like hedonic selection, habituation, peak shift, and so on. In this view, artistic creators seek critical attention for their productions and must therefore produce work that is ever more striking. This is most effectively achieved via producing more unusual combinations of ideas within an artistic style or by developing a new style altogether. In aesthetic domains, these pressures are relentless; fitfully, in one of his final papers, Martindale (2009) argued that this dynamic has a specific, predictable endgame: the quest for novelty eventually produces works that fail to communicate to audiences, at which point that artistic tradition dies.

Whether one accepts this conclusion or not (see the numerous commentaries to Martindale, 2009), the tension between creators’ drive to innovate versus the possible negative consequences of doing so reflects a fundamental aspect of high-level human creativity. And while the communicative relation between creators and audiences likely represents an important facet of this interplay, in this paper we wish to consider another aspect: the role of constraints on how novelty proceeds in the first place.

The idea that novelty may be generated in part by imposing unusual constraints has been espoused by some eminent creators – witness Stravinsky’s (1942) dictum that “freedom will be so much the greater and more meaningful the more narrowly I limit my field of action and the more I surround myself with obstacles” (p. 65). This theme is also prominent in some discussions and research about creativity. Constraints may be fairly explicit – for example, as a means of generating novelty via contrast with a predominant artistic style (Stokes, 2007). Conversely, they may be more implicit, only articulated in retrospect – for instance, in Kuhn’s (1962) conception of how scientific paradigms constrain even the questions that occur to researchers, or Rosen’s (1980) discussion of the organic evolution of sonata form in classical music as not reducible to a proscriptive textbook formula. In passing, we note that this general theme also bears on the issue of the relative blindness versus sightedness of ideational processes (e.g., Campbell, 1960; Simonton, 1999, 2011; cf. Sternberg, 1998; Weisberg, 2006).

Given their nature, the evidence for implicit constraints mainly takes the form of statistical regularities revealing an apparently arbitrary bias in how creative products are put together. In this paper, we apply this idea to the domain of Western classical music, which is replete with quantifiable regularities (see Krumhansl, 1990; Dowling, 1967; Huron, 2006). Many of these regularities result from explicit codified ‘rules’ of the domain concerning tonality, counterpoint, rhythm, voice-leading, instrumentation, form, and so on, which are part of every composer’s formal training (Copland, 1939). Interestingly, empirical research has revealed additional regularities, which are not necessarily explicit rules within the domain of music, but rather are principles to which composers seem naturally to adhere. For instance, in a pioneering study, Vos and Troost (1989) examined several principles that might underlie the creation of musical melodies. One is their finding that small intervals are used more far frequently than larger intervals: in a sample of 796
melodies from classical music and world-wide ethno-music, roughly 45% of all intervals were a half step or whole step, the two smallest diatonic intervals. Thus, whether composers are overtly aware of it or not, melodies tend to be assembled by putting together smaller, rather than larger, intervals.

More relevant presently is Vos and Troost’s (1989) additional provocative finding, on the same classical and ethno-music samples, that ascending melodic intervals are on average larger than descending intervals. From an information theory perspective, these patterns are thought to generate expectations in listeners (Huron, 2006) whereby a larger interval is followed by smaller intervals because the initial leap appears to skip critical information that the smaller intervals then fill in (see also Meyer, 1956). However, this explanation still begs the question of why ascending intervals tend to be larger than descending intervals, rather than vice-versa.

The ascending/descending asymmetry is a paradigmatic example of a creative constraint that seems largely, if not entirely, implicit. Its cross-cultural pervasiveness raises a number of important questions, not the least of which is the provocative possibility of a biological basis for this tendency. However, in this paper, our interest is in exploring the generality of this effect – specifically, in the Martindalesque context of dynamic tension between creators’ constant drive to innovate versus the inertia of implicit aesthetic or creative constraints. In our view, this issue can be most directly explored by targeting as revolutionary a creative figure as one can find – here, the modernist composer Arnold Schoenberg (1874–1951).

**Schoenberg as a case study**

Schoenberg was one of the most radical innovators in music history, for all of his pleading to the contrary (“I was never revolutionary” – quoted in Stein, 1975, p. 137). He introduced profound novelty in tonality, harmony, orchestration, thematic treatment, musical form, notation, and pedagogy (Frisch, 1999; Haimo, 1990; Leibowitz, 1949; Shawn, 2002; Stuckenschmidt, 1977). Some have argued that Schoenberg’s iconoclasm undermines basic cognitive principles that allow the brain to turn pitches into coherent musical experiences (Ball, 2011; Thomson, 1991), resulting in his relative unpopularity in the concert hall. Regardless, Schoenberg’s importance in musical history is formidable. By one estimate, using page citations in music history books (Murray, 2003), he is the thirteenth most eminent classical composer of all time, outranking luminaries like Brahms, Chopin, and Verdi. Over his sixty-year career, he wrote some 900 minutes of masterpiece-level music (defined by inclusion in Halsey’s (1976) catalogue of the standard repertoire; data from Kozbelt, 2008, 2009). These works span an enormous gamut of styles and forms, ranging from the lush Romanticism of his early works to free atonality and then to his later invention of serialism and the tone row, in which the relations among an ordered set of 12 pitches forms the entire basis of the musical material of a composition.

Besides his undoubted historical importance, we chose to focus on Schoenberg for several additional reasons. First is his relatively large output of vocal music. Vocal works feature unambiguous melodic lines, which are more straightforward to code than instrumental works or works with numerous vocal lines, where the main melody may not be obvious, particularly given Schoenberg’s often dense partwriting. Moreover, many have noted the richness of Schoenberg’s vocal writing, with Leibowitz (1949, p. 52) even going so far as to comment, by comparison, on the relative “melodic poverty of [Richard] Strauss’s vocal lines.” Relatedly, Schoenberg’s work seems more likely than any other Western music to violate the traditional ascending/descending asymmetry. Intervallic leaps in Schoenberg’s music are larger than in any other music in the world except for yodeling (Huron, 2006). Perhaps this distended range also gives rise to an atypical pattern in the relative size of ascents versus descents. Additionally, the fact that Schoenberg’s later serial style is organized around a dodecaphonic tone row is significant: if a composer knows in advance that a row or melody will be inverted at some point in the composition, this could potentially lead to greater symmetry of ascending and descending intervals, since the ‘orientation’ of the melodic material would not be as set as in more traditional music.

In sum, determining whether or not Schoenberg’s music violates the usual ascending/descending asymmetry would inform the extent to which he preserved some well-entrenched (if implicit) aspects of traditional musical style, irrespective of his other innovations. This in turn informs how musical styles change along multiple dimensions over time – a point taken up in the Discussion.

**Method**

**Sample of works**

Our sample consisted of 97 vocal works by Arnold Schoenberg, dating from 1898 to 1933, and thus spanning most of his career. They include: lieders with piano or chamber accompaniment (Opp. 1, 2, 3, 6, 12, 14, 15, 20, and 48, plus two songs without Opus numbers: *Am Strande* and *Gedenken*), lieder with orchestral accompaniment (Opp. 8 and 22, plus 18 solos from the *Gurrelieder*), 21 pieces from the melodrama *Pierrot lunaire* (Op. 21), the two vocal movements from the *String Quartet #2* (Op. 10), and the monodrama *Erwartung* (Op. 17). Choral selections and operatic compositions were excluded. The year of composition for each work was also tabulated.

**Coding**

The vocal line of each of the 97 works was coded from beginning to end, using printed scores. Each interval was measured in semitones (e.g., C to the adjacent C#); thus, a minor second received a score of one, a major second a score of two, an octave a score of 12, etc. Ascending intervals were coded as positive numbers; descending intervals, negative
numbers. Repetitions of a pitch were coded as zeroes. In all, 13,705 intervals were coded.

A complicating factor in coding the intervals involved when vocal phrase ends on a high note and after several measures of rests a perceptibly new vocal phrase begins on a low note, including the large inter-phrase descending interval in the coding probably distorts the meaning and utility of the measure. To address this issue and avoid subjective interpretations of phrase boundaries, after all of the intervals were initially coded, we adopted three phrase boundary criteria: whole rests, half rests, and quarter rests. Intervals spanning the relevant rest criterion were deleted from the dataset. Ultimately, there were few differences in the results across the phrase boundary criteria. Below, we focus on results based on the half rest criterion unless otherwise noted.

Having applied the relevant phrase boundary criterion, average ascending and average descending intervals were computed for each vocal work. All consecutive repetitions of a pitch, coded as 0, were excluded from analysis. For each work, the mean of the ascending intervals (a positive number) and mean of the descending intervals (a negative number) were added, yielding an asymmetry score for that composition. A value of 0 indicates no ascending/descending asymmetry; a positive value indicates ascending leaps and descending steps (as has typically been found in archival studies); a negative value indicates ascending steps and descending leaps.

**Results**

The $M (SD)$ asymmetry scores for the 97 vocal works = $+0.522 (0.812)$, using half rests as the criterion for phrase termination. Scores were approximately normally distributed. $M (SE) = .206 (.245)$ and -.324 (.485) for skewness and kurtosis, respectively. (Virtually identical descriptive statistics were obtained using whole notes and quarter notes as phrase terminator criteria.) Asymmetry scores for the 97 works were first compared to a value of 0 (representing no ascending/descending asymmetry) using a single sample $t$ test. The result was highly reliable, $t (96) = 6.338, p < .001$, Cohen’s $d = 0.64$, a medium-to-large effect size. The positive value of the mean asymmetry score indicates that Schoenberg’s vocal works preserve the usual pattern of ascending leaps and descending steps.

Beyond just establishing that Schoenberg’s vocal music shows the typical asymmetry, we also examined the possibility that it reliably differed even from the usual strength of the effect. For this analysis, we again used a single sample $t$ test but compared our statistic to a test value of $+0.224$, instead of 0. This estimate was computed based on the overall frequency of different melodic intervals and the proportion of those intervals showing ascending versus descending motion in the general classical repertoire, as reported by Vos and Troost (1989). This conversion was necessary to generate a measure of ascending/descending asymmetry that was comparable to the one we used for Schoenberg’s vocal works. Doing this also allows us to take advantage of our reasonably large sample size, since on this measure the unit of analysis becomes the composition rather than the interval. Again, the result was highly reliable, $t (96) = 3.620, p < .001$, Cohen’s $d = 0.37$, a small-to-medium effect size. This result suggests that Schoenberg’s vocal works not only preserve the usual melodic interval asymmetry, but that they do so to a reliably greater extent than Western classical music in general.

As a final analysis, we explored whether this asymmetry reflects Schoenberg’s own musical evolution in any systematic way. In other words, as Schoenberg progressed through his late Romantic, atonal, and serial musical styles, did his vocal works show any systematic changes in ascending/descending asymmetry? A Pearson correlation between asymmetry scores (using the half note phrase termination criterion) and year of composition suggested no systematic relation between the two variables, $r (95) = .14, p = .17$. Indeed, if anything, the numerically positive correlation suggests that the pattern of ascending leaps and descending steps became slightly more pronounced later in his career (e.g., in the three tone row-based Op. 48 songs from 1933, the latest works analyzed here, all of which show a strong pattern of ascending leaps and descending steps across all phrase termination criteria).

**Discussion**

Our results suggest that despite his many innovations, Arnold Schoenberg preserved — and even exaggerated — the asymmetrical pattern of ascending leaps and descending steps typically found in Western classical music and in folk music around the world (Vos & Troost, 1989; see also Huron, 2006). This indicates that Schoenberg’s iconoclasm did not extend to all important aspects of music, suggesting the need for a nuanced, multi-metric approach to fully capture stylistic evolution in music.

Degree of asymmetry was not reliably correlated with Schoenberg’s age at composition, revealing that he did not significantly modify this aspect of his musical language over the course of his career, even as his overall style went through other numerous changes. This latter finding echoes results by Kozbelt and Meredith (2011), which found that melodic originality (defined by note transition probabilities) did not systematically vary with composer age, which incidentally begs the question of how multi-generational trends in melodic originality (see Kozbelt & Meredith, 2010; Simonton, 1980) are propagated, if not by the career trajectories of the individual creators constituting that aesthetic tradition. As with operationalizing aspects of musical style, the propulsive dynamic between individual career trajectories and the development of a broader tradition

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19 In passing we note that the same correlation using the whole note phrase termination criterion yielded a marginally reliable result, $r (95) = .19, p = .06$, but we do not interpret this as a reliable effect, particularly since the quarter note phrase termination criterion yielded a non-significant correlation $r (95) = .13, p = .21$. 

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cries out for more careful conceptualization, measurement, and analysis.

The present study probably better serves as an illustration of how to assess a particular question in musical aesthetics than providing a generalized theory. However, we argue that the particulars of our approach have several methodological advantages that could well be taken up in additional studies. First, the measure of ascending/descending asymmetry is completely objective: once the phrase boundary criterion is set, interval coding is algorithmic. Second, this approach yields a metric whose unit of analysis is the individual musical work, which increases statistical power with the sample size (cf. measures whose unit of analysis is the interval — e.g., Vos & Troost, 1989). Third, the asymmetry measure circumvents a key limitation of some information theory-based measures of musical style, in not requiring a reference population, as do measures of melodic originality relying on the frequency of particular note-to-note transitions (see Kozbelt & Meredith, 2010, 2011; Paisley, 1964; Simonton, 1980, 1994). Such population-dependent measures anachronistically combine and confound works from different historical epochs and penalize prolific but stylistically consistent composers in terms of originality — none of which is an issue here. A final advantage, in our view, is a focus on just one composer. While this approach arguably limits generalization, individual case studies of composers (e.g., Kozbelt, 2005, 2007; Simonton, 1987; Weisberg, 1994) have provided useful information bearing on a number of particular questions about musical creativity. Moreover, pooling data across many composers raises its own methodological issues, including the “composition fallacy” (Simonton, 1988), whereby aggregate results can be mistakenly thought to apply to each individual in the sample, unless significant statistical and analytic precautions are taken (see Kozbelt, 2008).

These methodological advantages have potential to inform not only particular questions about specific composers, as we have attempted here, but also to address far broader questions of trans-historical style change in aesthetic domains. Our approach to the ascending/descending asymmetry echoes that of Martindale (1990, 1994), for instance, in understanding the evolution of British poetry. Recall that his theory predicts that the arousal potential of aesthetic artifacts should always increase over time. In contrast, other scholars (e.g., Wilson, 1926) have argued that artistic traditions oscillate between two poles: the neo-classical, characterized by order, restraint, and rationality; and the romantic, characterized by emotion and rebellion. Neo-classical British poetry around the year 1700 provides a venue for testing these ideas, since the two theoretical perspectives make highly divergent predictions. Using objective computer-based text analysis, Martindale found that some measures of arousal potential decreased in poems of that period, but that this trend was more than offset by increases in other measures. While this would seem to have settled the issue (against Wilson), one might also argue that Martindale’s analysis was limited in that the overall measure of arousal potential equally weighted all of its constituent factors — a procedure that may or may not be justified. Thus, uncertainties in even the most sophisticated studies of trans-historical style change in the arts reinforce the need for methodological and conceptual care in addressing these questions.

Applying Martindale’s approach to the evolution of musical style, one might posit Vos and Troost’s (1989) ascending/descending asymmetry as one ideal candidate measure of stylistic evolution. To our knowledge, no trans-historical assessment of this measure has been undertaken, though in principle there is nothing to prevent this (cf. Kozbelt & Meredith, 2011; Simonton, 1980). Indeed, ascending/descending asymmetry represents only one of a large number of possible operationalizations of musical style, which could contribute to an understanding of trans-historical changes in style, which in turn informs the very nature of musical and artistic creativity (for discussions, see Martindale, 2009; Kozbelt & Kaufman, in press). Robust answers to questions of stylistic evolution may have to emerge through the steady accumulation of a variety of detailed investigations, as we have attempted presently, to determine how various metrics of style may change, trade off with one another, and co-evolve throughout music history.

Ultimately, such research may also bear on deep questions we have had to bypass in this paper, specifically, how pervasive but largely implicit tendencies like the ascending/descending asymmetry may or may not be grounded in cognitive or biological mechanisms. If human aesthetics and creativity are strongly canalized in particular ways due to our evolutionary history and neuroanatomical functioning, what are the options for a creator — like Schoenberg — who wants to break with an aesthetic tradition in highly novel ways, while still achieving recognition? How against the grain of biology can innovation go?

Acknowledgments

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References


The Art of Framing Art

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Abstract
Contextual information can influence appreciation of artworks. We assessed the impact of social and monetary primes in a large cohort of art-naïve university students. Our results show that paintings with high monetary primes are rated as more attractive compared to non-primed paintings. As expected, paintings with high ratings by peers and art experts lead to higher ratings. Interestingly, participants also gave higher ratings for paintings that received a low rating by an undesirable social comparison group. This may be explained by a need from participants to distance themselves from this social category. Our findings underscore the complex interplay between art appreciation and social and monetary primes.

Keywords: Visual art; priming; framing; social group impact; monetary impact.
Aesthetic Appraisal Among Nonprofessionals

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Abstract
We investigated justifications that 125 nonprofessionals gave for appraisals of aesthetic products. Narratives used to explain music and film preferences were gathered and coded. We found that while the majority of comments were aesthetic, one-third of coded statements were nonaesthetically biased. In addition, 97.6% of the participants used a nonaesthetic comment at least once. Observed biases fell into ten categories, with the most common biases being personal idiosyncrasies and genre preferences. Measured background variables did not predict the level of bias exhibited, except that people more passionate about music and film dimensions of aesthetics (as measured by the Desire for Aesthetics Scale) were less biased in their positive appraisals. People also tended to be more biased about musicians than films.

Keywords: Aesthetic appraisal; aesthetic judgment; aesthetic merit; nonaesthetic biases; music and film ratings.

Introduction
Why do people like or dislike specific works of art? Personal agendas rather than disinterested taste preferences appear to exist (Burt, 1933; Cupchik, 1992; Holbrook, 1999; Hume, 1767; Kant, 1790; Silvia, 2013; Winston, 1992), which can “contaminate” judges’ evaluations of aesthetic works (Eysenck, 1988; Levinson, 2010). Lundy (2013) compiled 11 potential nonaesthetic biases in ratings of aesthetic works (familiarity, historical, conformity, genre, subject matter, personal prejudices, personal idiosyncrasies, impaired state, lacking in good sense, unbalanced judgment, numerical rating). Many of these biases seem to be similar to other human heuristics, including stereotyping and prejudiced tendencies. An example of the familiarity bias would be “I don’t really know them but I already know I don’t like their work”. Via the conformity bias, one might think that a piece of obscure music is bad simply because it is not popular, or assume that a well-known film is good simply because it is popular. In contrast, aesthetically relevant comments might include statements about the quality of the acting or cinematography of a film, or the beauty of the vocals or poetic lyrics of a musician.

We investigated the extent to which such nonaesthetic biases would occur (compared to aesthetic comments) when nonprofessionals were asked to describe why they liked or disliked particular musicians and films. We were also interested in investigating which biases would be the most common, as well as whether biases would be related to individual background variables, such as age, level of familiarity with a wide array of musicians and films, or general aesthetic motivation. We expected to find that those with a greater familiarity with a wider array of music or movies, and those scoring higher on the Desire for Aesthetics Scale (Lundy, Schenkel, Akrie, & Walker, 2010), would exhibit fewer biases. We also investigated whether particular comments were similar to general stereotyping and prejudicial comments seen in other areas of life.

Method
An internet sample of 173 participants on Amazon’s Mechanical Turk were paid 50 cents each if they completed all of the questionnaires. We had to drop 48 participants due to incomplete responses, leaving a final sample size of 125 (53 males and 72 females). Participants filled out demographic information and were then given a randomly selected list of 396 movies and 200 musicians to evaluate on a 0 to 10 scale in terms of aesthetic quality. Based on their ratings, they were then asked to pick one highly-rated musician, one highly-rated movie, one low-rated musician, and one low-rated movie. They were also instructed to give detailed explanations for why they rated each musician and movie the way they did. Thus, each participant contributed four narratives. Participants also filled out the Desire for Aesthetics Scale (DFAS), which indicated their level of interest in aesthetics in general, across various aesthetic...
domains. See Table 1 for demographic information about the sample.

Table 1: Demographic Information of Participants

<table>
<thead>
<tr>
<th>Variable</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males: Females</td>
<td>53: 72</td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>19–65</td>
</tr>
<tr>
<td>Mean</td>
<td>34.8</td>
</tr>
<tr>
<td>Median</td>
<td>32.5</td>
</tr>
<tr>
<td>Level of Education</td>
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<td>Graduate Degree</td>
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</tr>
<tr>
<td>Some Graduate School</td>
<td>4.0%</td>
</tr>
<tr>
<td>Bachelor Degree</td>
<td>39.2%</td>
</tr>
<tr>
<td>Some College</td>
<td>24.8%</td>
</tr>
<tr>
<td>High School Diploma</td>
<td>8.0%</td>
</tr>
<tr>
<td>Some High School</td>
<td>0.8%</td>
</tr>
<tr>
<td>Race</td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>53.6%</td>
</tr>
<tr>
<td>Asian</td>
<td>31.2%</td>
</tr>
<tr>
<td>African American</td>
<td>6.4%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>7.2%</td>
</tr>
<tr>
<td>Other</td>
<td>1.6%</td>
</tr>
</tbody>
</table>

Each of the narratives was independently coded by three judges and relevant comments were labeled as either aesthetic or nonaesthetic. Nonaesthetic comments were categorized into the 11 nonaesthetic biases categories.

Results

Interrater reliabilities of coded narratives among three judges were high (average Cohen’s kappa = .91), implying substantial agreement about what was nonaesthetic vs. aesthetic. The main issue was that some statements were tough to decide whether to code at all, partly due to weak grammar and ambiguity in participants’ use of language. The average length of the narratives was 48 words per narrative. (SD = 24.46, Mdn = 45.25). Considering that each participant completed four narratives, these numbers suggest that participants took the task of explaining their preferences seriously.

Among the coded statements that all three judges agreed about, the proportion of nonaesthetic comments vs. aesthetic comments ranged from 0 to 100% (average proportion = 35.3% nonaesthetic vs. 64.7% aesthetic). In other words, over one-third of all participants’ comments were nonaesthetic in nature compared to under two-thirds of the comments being aesthetic. However, 97.6% of the participants made at least one nonaesthetic comment. Overall, there were a total of 250 nonaesthetically biased statements in the narratives agreed upon by the coders. Furthermore, 85.8% of the 500 narratives contained at least one nonaesthetic statement.

Aesthetic statements made by participants about musicians tended to fall into one of the following categories: durability, dynamics, instrumentation, lyrics, melody, originality, production, sophistication, or vocals. Aesthetic statements made by participants about films tended to fall into one of the following categories: acting, cinematography, direction, durability, music, originality, plot, production values, screenplay, or sophistication.

The most commonly occurring biases in the narratives consensually coded by all three judges were Personal Idiosyncrasies (65), Genre (39), Personal Prejudices (27), Numerical Rating (27), Conformity (16), and Familiarity (15). All biases occurred at least twice except the Unbalanced Judgment bias (UJ), which did not occur clearly in any of the narratives (defined as an overfocus on one aesthetic dimension of quality, while ignoring or underestimating the effect of other dimensions; Lundy, 2013). Below is a summary of each of the observed biases in order of how often they occurred. See Figure 1 for a visual display of the relative frequency of each of the possible categories of bias.

Personal Idiosyncrasies bias (PI)
Definition: idiosyncratic characteristics of the self that are not relevant to aesthetic quality judgment
Frequency of occurrence: 65
Example statement from narratives: “I lost my virginity to one of their songs…”

Genre bias (Ge)
Definition: summarily assuming that entire genres of artworks are practically all good or all bad
Frequency of occurrence: 39
Example statement from narratives: “It is a romantic comedy film so I give the highest rating.”

Personal Prejudices bias (PP)
Definition: an unjustifiably negative or positive attitude toward certain types of art merely associated with some outgroup as distinguished from one’s ingroup
Frequency of occurrence: 27
Example statement from narratives: “I also don’t appreciate the culture that their fans embrace.”

Numerical Rating bias (NR)
Definition: quantitative rating weaknesses that undermine one’s ability to give quantitatively proportional aesthetic appraisals, such as imprecise rating scales or highly skewed rating distributions
Frequency of occurrence: 27
Example statement from narratives: “Remember the Titans (2000) I give it a 5. I think movie is especially low because most of the movies I saw were good.”

Conformity bias (Co)
Definition: ultimately basing one’s judgment of an artwork on others’ reactions to the work, rather than one’s own intimate experience and independent appraisal  
Frequency of occurrence: 16  
Example statement from narratives: “The film was a huge box-office success...”

Familiarity bias (Fa)  
Definition: appraisal of aesthetic works being affected by unequal levels of familiarity across various works  
Frequency of occurrence: 15  
Example statement from narratives: “However, I don’t know that I’ve actually heard his recorded versions, or if I’ve just heard covers by other musicians.”

Subject Matter bias (SM)  
Definition: basing aesthetic appraisal predominately on the topic of the artwork  
Frequency of occurrence: 12  
Example statement from narratives: “Nothing is low everything is nice. Every movie I liked.”

Lacking in Good Sense bias (LIGS)  
Definition: basic prerequisite qualities missing within a judge that are necessary for competent appraisal of artworks (such as intelligence, knowledge, aesthetic motivation, openness to experience, emotional stability, and logic)  
Frequency of occurrence: 4  
Example statement from narratives: “Most of the musicians on this list are very old.”

Historical bias (Hi)  
Definition: being unduly influenced by one’s place in history, such as an inflexible aversion to artistic innovation  
Frequency of occurrence: 2  
Example statement from narratives: “I usually enjoy slow movies like this when I have the flu, but I couldn’t even watch it sick.”

Impaired State bias (IS)  
Definition: rating artworks when one is not in a personal state conducive to competent appraisal (e.g., sleep-deprived, intoxicated, in a bad mood, fatigued, highly stressed)  
Frequency of occurrence: 2  
Example statement from narratives: “I usually enjoy slow movies like this when I have the flu, but I couldn’t even watch it sick.”

Given that the three judges agreed for the most part about how to code the statements, to reduce the complexity of the analyses the two judges with the highest agreement were used for the rest of the analyses. The average number of instances of each bias coded by the two judges was used. In terms of who was biased, the number of musicians heard and the total proportion of nonaesthetic comments for music were not correlated \((r = -.104, p = .252)\). The number of films seen and the proportion of comments that were nonaesthetic about films were also not correlated, although it was in the predicted direction \((r = -.118, p = .199)\). Participants on average had heard 35.57 musicians (\(SD = 34.10, Mdn = 23.0\)), and had seen 30.17 films (\(SD = 25.48, Mdn = 24.0\)). This represented familiarity with 17.8% of the musicians and 7.6% of the films from our lists.

The potential link between general aesthetic motivation (DFAS scores) and proportion of nonaesthetic comments was in the predicted direction but was not significant \((r = -.136, p = .129)\). However, for the DFAS items specific to films and music (7 of 36 items), there was a negative correlation between DFAS scores and proportion of nonaesthetic biases \((r = -.194, p = .03)\), implying that people with higher aesthetic motivation for music and film tended to show less bias in their appraisals. In addition, total DFAS scores were negatively correlated with proportion of nonaesthetic comments for highly-rated musicians and movies \((r = -.228, p = .011)\), suggesting that people with a general interest in aesthetics tended to be less biased in their appraisal of highly-liked music and film. This tendency became even stronger for the movie and music DFAS items \((r = -.268, p = .002)\). Overall, these findings suggest that those who are less passionate about the aesthetics of music and film tend to be more biased in their reasoning about why they like certain music and films. This effect tended to disappear for disliked music and films.

In line with this pattern of findings, the proportion of nonaesthetic comments for low-rated musicians or films \((M = .551, SD = .31)\) was higher than the proportion of nonaesthetic comments for highly-rated musicians or films \((M = .370, SD = .29)\). \(t(123) = -5.70, p < .0005\). Biases appear to be more pronounced for disliked aesthetic products compared to well-liked ones, but those who are more passionate about aesthetics are less biased when it comes to well-liked aesthetic products.

We also found that the proportion of nonaesthetic comments made about musicians \((M = .552, SD = .33)\) was higher than it was for comments made about films \((M = .381, SD = .27)\). \(t(121) = -5.38, p < .0005\). Furthermore, proportion of nonaesthetic comments for musicians was positively correlated with proportion of nonaesthetic comments for films \((r = .324, p < .0005)\), suggesting that people who were relatively biased in one domain of aesthetics tended to be similarly biased in a second domain of aesthetics.

Age and the proportion of nonaesthetic comments were not correlated, although there was a trend toward older individuals showing less bias \((r = -.134, p = .138)\). There was not a gender difference in proportion of nonaesthetic biases \((t(123) = .94, p = .348)\). Graduate students tended to show a lower of proportion of nonaesthetic biases than those with only high school education, although this was only marginally significant \((t(43) = 1.73, p = .09)\). One problem with this analysis, however, was that there were only 11 students in the high school group.
We expected nonaesthetically biased explanations to be common when people were asked to justify their appraisals of liked and disliked musicians and films, and this was found to be the case. Although actually less common than aesthetic comments, biased statements occurred on average in over one-third of all coded statements, while just under two-thirds were aesthetic statements. In addition, almost all participants made at least one nonaesthetic comment within their four narratives.

The most frequently coded bias was the Personal Idiosyncrasies bias. The commonality of statements coded under this bias supports other findings that peoples’ preferences for artworks relate to factors that go well beyond the artworks themselves, such as being emotionally comforted (Winston, 1992).

The second most common bias was the Genre bias. This finding fits with sociological research on the existence of taste publics/taste cultures in aesthetic judgments, in which people figuratively wear their aesthetic preferences like badges of honor (Austin, 1983; Denisoff & Levine, 1972; Dixon, 1982; Fox & Wince, 1975). This tendency is akin to ingroup and outgroup thinking applied to aesthetics. Farnsworth (1950) stated that “It is a truism that the people of each culture area are likely to regard their art forms as God-given and superior to those of their neighbors” (p. 23). Holbrook (1999) found that laypersons are more likely than professionals to condemn an entire genre. Our data suggest, however, that this bias is more pronounced for appraisals about musicians compared to films.

Statements suggesting a Personal Prejudices bias were also not uncommon, supporting the idea that reactions to artworks can be biased in the same way that people are biased against certain races or lifestyles. Hume (1767) stated that, “Where he lies under the influence of prejudice, all his natural sentiments are perverted” (p. 17). Fans of one style tend to abusively criticize other styles (Frith, 1983), and this can be a way of choosing friends and rejecting others (Zillman & Gan, 1997), often based along socioeconomic (Gans, 1974; Schuessler, 1948), education (DiMaggio & Useem, 1978), and ethnic dimensions (Denisoff & Levine, 1972; Dixon, 1982). All of these findings further support the suggested link here between stereotyping/prejudice and aesthetic judgements. Differences in taste between groups likely amplify differences between social groups (Russell, 1997); however, increased exposure and appreciation of another culture’s music could help to reduce stereotyping and prejudice about the music and the people who listen to it.

Our findings also suggest that biases tend to be most pronounced for disliked music and film (as compared to well-liked music and film), although this appeared to be attenuated somewhat for those people who had a stronger interest in aesthetics in general. Biases were also more pronounced for music than for film. Thus, the worst case scenario for
nonaesthetic bias appears to be someone with little passion for aesthetics who is describing why they dislike a certain
musician.

Limitations of this study include the possibility that not all biases will be consciously displayed in the narratives of the nonprofessionals. Biases could be committed without people knowing they are committing them, so these would not show up in our research design. In this sense, the actual level of bias could be higher than the nature of the evidence could pick up on using the design employed here. Another limitation was that some participants did not use proper grammar, so some statements that may have been nonaesthetically biased were uninterpretable or were not coded consensually by the judges. Also, some statements were coded by one judge but not coded by other judges.

One strength of the current study is that the sample was fairly nontypically diverse: most participants were not undergraduates and many were from various countries outside the United States. The average age was close to 35, and the sample included a wide range of race (almost half not Caucasian) and education (including almost one quarter with a graduate degree). However, given the marginally significant negative correlation between education and level of bias, a less educated sample may show evidence of even higher bias. Along the same lines it would be informative to measure the relative level of bias in much younger samples with less education than high school.

Our next study will analyze narratives of professional music and film critics to compare their level of bias compared to the current sample of nonprofessionals. We expect professionals to commit fewer biases. Knowledge of these biases could also be studied in other aesthetic areas beyond music and film, and be used to evaluate the relative quality of professional and nonprofessional appraisals. A future study could also compare professional critics to nonprofessionals in art-related careers.

In conclusion, there is clear evidence that most nonprofessionals use a variety of nonaesthetically biased statements to justify their music and film preferences. At times, people seem to employ stereotyping and prejudicial heuristics for some of their justifications with respect to musician and film preferences. At the same time, many statements made by nonprofessionals actually appear to be aesthetic in nature, suggesting that some people are already well on their way toward less biased appraisal. It will be interesting to see where professionals tend to fall along this aesthetic-nonaesthetic continuum.

References


Clinical Symptomatology and Reward Responsiveness
Influence Preferences for Aesthetic Images

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Abstract
To what degree is the aesthetic response to an artwork related to its cognitive reward value? Participants from clinical and non-clinical populations were given a rating task and a scheduleless keypress task to assess their hedonic response to and motivation to view a wide array of visual art. Participants also completed self-report measures assessing clinical symptomatology and deficits in reward function, including the MADRS, BIS-BAS, TEPS & STAI. Factor analysis uncovered 4 main factors from the self-report measures, and multiple regression revealed two significant relationships: one between clinical symptomatology and between-subject agreement in image viewing time, the other between reward seeking and observer’s variability of responses in the preference rating task. Implications for models of reward are explored.

Keywords: aesthetic preference; psychopathology; factor analysis; liking; wanting; reward; scheduleless keypress

Introduction
Aesthetic experience has historically been described as intrinsically rewarding, and recent neuroimaging research points to this fact. The appreciation of aesthetic stimuli involves the activation of brain regions associated with reward processes, such as the ventral striatum and orbitofrontal cortex (Vessel, Starr & Rubin, 2012). However, there has been little inquiry into how aesthetic stimuli are processed by the many facets of the cognitive reward system. The present study seeks to illuminate the relationship between aesthetic response and the reward constructs of “liking,” the hedonic response to a stimulus, and “wanting,” an individual’s willingness to work for a rewarding stimulus (e.g. incentive salience or approach motivation). Previous studies have shown a relationship between liking and wanting for images of beautiful (“aesthetically pleasing”) faces. Heterosexual males appreciated the beauty of faces of both genders, but only worked to extend their viewing time of beautiful female faces (Aharon et al., 2001). There is evidence that this dissociation between liking and wanting is moderated by the presence of psychological disorders like PTSD (Elman et al., 2005).

The present study extends this investigation of reward function into the aesthetic realm with two goals: to reveal the conditions leading to such dissociations for visual artwork, and to identify differences in the “liking” and “wanting” of art between clinical and non-clinical populations using the scheduleless keypress paradigm. Intense responses to aesthetic objects are associated with activity of the brain’s default mode network (DMN; Vessel, Starr & Rubin, 2012). Because disturbances in DMN functioning have been implicated in several mood disorders, we hypothesized that individuals with mood or anxiety disorders would display a dissociation between liking and wanting for aesthetic stimuli.

Methods
Participants
35 participants from clinical and non-clinical populations were recruited through the NYU Langone Medical center and consented to completing the tasks required of the current study as well as a battery of clinical inventories. 4 participants failed to complete the full clinical battery and were excluded from analysis, leaving n = 31 (20 female, 2 left-handed, 1 ambidextrous, age M = 28.33, SD = 10.33) in the final sample.

Stimuli
The stimulus set comprised 109 images of artistic paintings reflecting diverse cultural traditions (American, European, Indian and Japanese) and time periods (from the 15th century to the recent past.) Artworks were chosen to reflect a wide variety of content, including portraits, still-life, natural scenes, and abstract works. Images were selected from the Catalog of Art Museum Images Online database (CAMIO: http://www.oclc.org/camio/default.htm) and restricted to artwork that is not commonly reproduced, to diminish recognition and familiarity effects. Participants in a previous study generally recognized few (3-5) images from this stimulus set (Vessel, Starr & Rubin, 2012).

Participants viewed all 109 images in each task. 25 images were also selected to be presented in a block at the end to compute a within-task agreement score, yielding a total of 134 trials for each task.

**Procedure**

Participants completed a number of self-report measures, then engaged in two behavioral tasks – a rating task and a keypress task – on the computer.

**Self-Report Measures**

Before the behavioral tasks, participants were given three questionnaires to complete by hand – a Background Questionnaire, the Temporal Experience of Pleasure Scale (TEPS; Gard, Gard, Kring, & John, 2006), and the State-Trait Anxiety Inventory (STAI; Spielberger et al., 1983).

The Background Questionnaire solicited participants’ demographic information including age, handedness, gender, sexuality, history of neurological illness, history of mental illness, current medication status, and artistic expertise.

The TEPS asked participants to respond to 18 statements based on their pleasurable experience in the past week. The scale evaluates individual ability to have hedonic experience, with 10 items reflecting anticipatory pleasure capacity and 8 items reflecting consummatory pleasure.

On the STAI, participants responded to statements assessing their anxiety in the present moment (“state” anxiety) and their general experience of anxiety (“trait” anxiety).

In addition, participants completed a number of other measures assessing their clinical symptomatology, including the HAM-A (Hamilton, 1959), MADRS (Montgomery & Asberg, 1979), BIS-BAS scales (Carver & White, 1994), and Barratt’s Impulsiveness Scale (Patton, Stanford & Baratt, 1995). These measures were completed before or after the behavioral tasks as part of a full clinical examination at the NYU Langone Medical Center.

**Keypress Task**

After the self-report measures, participants completed the keypress (KP) task (fig. 1B). Participants were seated at a comfortable distance from the computer monitor and given a QWERTY keyboard with the “z” and “x” keys labeled with minus signs (”-“) and the “,” and “.” keys labeled with plus signs (“+”). Participants were told that they would be presented a series of art images for a short duration each, and that they could increase the length of this duration by alternately pressing the “+” keys, and shorten the duration by alternately pressing the “-” keys. To promote participant compliance and reduce pressing merely to shorten the task length, participants were told that the total task length would remain the same regardless of their pressing pattern, and that they would be controlling which images they view as though they were browsing the works in a museum. After reading the instructions and completing 8 practice trials, each image was presented one at a time. If no keys were pressed, images remained on the screen for 4s before being replaced by the next image in the series. Although previous studies have used a neutral time of 8s (Aharon et al., 2001; Elman et al., 2005),
data from Aharon et al. (2001) show that 4 seconds is closer to a naturalistic viewing time.

Each alternating button press increased or decreased the viewing duration of the current image according to the formula: \( \text{new total time} = \frac{\text{old total time} + (\text{extreme time} - \text{old total time})}{k} \), where \( \text{extreme time} \) is 0 for negative presses or 8 seconds for positive presses, and the rate constant \( k \) is 20. Data was taken in the form of the number of seconds each image was presented on the screen.

The KP task was presented first because pilot testing demonstrated an artificial inflation of within-subject within-image reliability on the KP task when the rating (RA) task was first. Using images of landscapes as stimuli, it was found that having the rating task first increased the KP reliability significantly from 0.4535 to 0.6136 (\( p = 0.044 \)). Consequently, the KP task was presented first to avoid type-I errors. Having the KP task first also has a precedent from other studies using the KP-RA paradigm (Aharon et al., 2001; Elman et al., 2005). After finishing the KP task, participants took a short break and proceeded to the rating task.

### Rating Task

In the rating task (fig. 1A), participants were told that they would view a set of paintings and be asked how much each painting “moves” them. They were instructed that the artworks would feature a wide range of content, and to respond based on what works they found powerful, pleasing or profound.

Participants read the instructions and completed 2 practice trials. Each trial consisted of a fixation point flashed on the screen for .5s followed by an art image for 3s. After the image presentation, a prompt inquiring “How strongly does this painting move you?” appeared above a 7-point rating scale, displayed as a row of boxes on the bottom of the screen, with 1 being “least” and 7 being “most.” Participants responded to this question using a computer mouse; data was taken in the form of the rating for each image.

### Results

#### Self-Report Measures

Exploratory factor analysis of the 14 self-report measures was completed in SPSS, revealing 4 factors with eigenvalues > 0.95 (Table 1). Factor 3 (Clinical Symptomatology) accounted for the most of the variance (eigenvalue = 6.735), with factor 4 (Experience of Pleasure) accounting for the second-most (eigenvalue = 3.263). Factor 2 (Motivation to Obtain Reward) accounted for the least variance (eigenvalue = 1.801), while Factor 1 (Behavioral Control) accounted for the second-least (eigenvalue = 2.736). Because the factor analysis implemented a direct oblimin rotation, the eigenvalues cannot be squared to estimate the total variance. For the unrotated solution, the four-factor model accounted for 76.77% of the variance.

Total MADRS scores indicated that 17 out of the 31 participants displayed clinical symptomatology (MADRS score > 6; Herrmann et al., 1998), leading to a post-hoc categorical division of clinical and non-clinical participants.

#### Keypress Task

On the keypress task, participants’ average viewing time was 4.19s (\( SD = .823 \)). Their average within-task agreement was .632, with each individual’s agreement calculated as the

![Table 1: Factor Analysis of Self-Report Measures.](image-url)
Figure 2. Select results of the multiple regression analyses. Starred bars indicate significant (p < .05) beta values.

(A) Beta weight values for each factor when predicting mean-minus-one (MM1) correlations for the keypress task. Factor 3 (Clinical Symptomatology) has a significant negative beta value in the keypress task but not the rating task, indicating that those displaying greater clinical symptomatology show less consistency to the greater population for which images they extend or reduce the viewing time, but generally agree in their ratings.

(B) Beta weight values for each factor when predicting MM1 correlations for the rating task.

(C) Beta weights for each factor predicting the $-\log_{10}(k)$ slope distribution, an indicator of variability, of the keypress task.

(D) Beta weights for each factor when predicting the standard deviation for the rating task. Factor 2 (Motivation for Reward) has a significant negative beta value in the rating task but not the keypress task. Because BAS-DR and BAS-RR have negative loadings on factor 2, this indicates that low motivation to obtain reward predicts a more limited use of the rating scale.
correlation between their initial viewing time of the 25 repeated images and their viewing time at the second presentation.

**Rating Task**

On the rating task, participants’ average rating score was 3.67 (SD = 1.63). Their average within-task agreement was .857. The average correlation between an observer’s viewing times and their rating responses to the same artworks was significant at .539 (p < .01). However, some observers …

**Multiple Regression**

Scores from the factor analysis were entered into a multiple regression analysis to see if they were predictive of a variety of performance variables on the keypress and rating tasks (Fig. 2). “Mean-minus-one” correlations were calculated for each task by correlating each subject’s rating or keypress time for each image with those of the rest of the sample. This allowed for the identification of those with image preferences closer to the average of the full sample. Results of the regression for the keypress mean-minus-one agreement measure (F[26,4] = .933, R² = .18; Fig. 2A) indicate that they were significantly predicted by factor 3 (Clinical Symptomatology; β = -.50, p = .03). This was not the case for the rating mean-minus-one agreement measure (β = -.11, p = .64; Fig. 2B). These results are consistent with a 2-sample t-test of the keypress mean-minus-one agreement scores between the clinical (M = .219, SD = .192) and non-clinical (M = .376, SD = .192) groups (t(28) = 2.26, p = .03).

A multiple regression analysis was also performed to test whether any of the self-report factors were predictive of the variance of observer’s responses across different images. For the rating task, the standard deviation across responses was selected as a measure of variance (regression: F[26,4] = 1.78, R² = .21; Fig. 2D). For the keypress task, a Weibull function was first fit to each observer’s distribution of viewing times, and a log₁₀ transformation of the slope parameter (k) was used as a measure of variability in responding (regression: F[26,4] = .933, R² = .13; Fig. 2C). Factor 2 (Motivation to Obtain Reward) significantly predicted the rating task’s standard deviation (β = -.43, p = .028), but not the keypress task’s log₁₀(k) distribution (β = .19, p = .33).

Multiple regression analyses were also performed to test whether observers’ mean responses (rating: F[26,4] = .503, R² = .07; keypress: F[26,4] = .133, R² = .02), or agreement between responses on the rating and keypress tasks (F[26,4] = .908, R² = .12) were predicted by any of the self-report factors. No significant relationships were found.

**Discussion**

The multiple regression revealed two important dissociations. First, there is a relationship between clinical symptomatology and the mean-minus one correlation (a measure of how much each observers’ responses resembled those of the other participants) in the keypress task but not the rating task. This signifies that those high in clinical (specifically mood) symptomatology rate images in a similar fashion to the general population, but do not necessarily work to view those same images, instead finding different images to be the most rewarding. Note that the clinical symptomatology measure did not predict a reduced variance in keypress responding, which indicates that the reduced correlation with average looking times was not simply because observers’ exhibiting clinical symptomatology responded less on the keypress task. This indicates that individuals suffering from clinical symptoms do not find the same paintings rewarding (as measured by willingness to work, a measure of incentive salience) as individuals with no clinical symptomatology, but do still find some of the paintings rewarding.

Second, there is a relationship between reward seeking and variability of aesthetic ratings, but not variability of viewing times in the keypress task. The direction of the relationship indicates that those high in reward seeking showed greater variability in their average preference ratings across the set of images. It is striking that the factor reflecting reward seeking (e.g. BAS-RR and BAS-DR), rather than the factor reflecting the experience of pleasure (TEPS-A and TEPS-C), was predictive of rating variability, and that the reward seeking factor did not predict the variability of responding on the keypress task. This may suggest that the hypothesized relationships of these self-report measures and these two tasks to the constructs of “liking” and “wanting” may need to be revised. Regardless, these results suggest that variability of responses to artwork on the rating task, across a diverse population of healthy and clinical participants, was a reliable measure of an aspect of reward processing.

With a low sample size, this study is still in an exploratory phase. However, these results bode well for the use of aesthetic stimuli to investigate reward function.

**Acknowledgments**

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**References**


Higher Agreement of Preferences for Natural Landscapes Versus for Architecture Suggests that Evaluations of “Environmental Fitness” may Influence Preference

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Abstract

People are moved by natural scenes and prefer looking at some scenes more than others. Despite a long history of investigation of scene preferences in the landscape assessment literature, the factors driving preferences are not well understood. This study examined agreement across observers for a set of images of natural landscapes and for images of exterior architecture. Natural scenes contain semantic information that carries functional significance, while variations in individual features of a building carry little functional importance to non-expert viewers. As a result, we hypothesized that observers would form preferences for landscape images based on fitness-related considerations and more consistent preferences should exist for landscapes than for architecture. Results showed that agreement was indeed higher (approaching significance) for natural landscapes than images of exterior architecture.

Keywords: agreement; preference; landscape; architecture

Introduction

Individuals are moved by natural scenes, and the ease of accessibility with which one can find images of natural landscapes on desktop screensavers, college room posters, and paintings indicates a pervasive human inclination towards natural scenes. However, the components within a landscape driving preferences are not yet clearly understood. What factors govern preferences for different categories of visual stimuli? Measuring agreement across a set of individuals’ preference ratings can illuminate the underlying informational framework that mediates aesthetic preference judgments. The degree to which different individuals prefer the same images reveals a reliance on similar representations and processes. Previous studies have shown that observers show higher agreement for which real-world scenes they prefer (average pairwise correlation $r = 0.46$) than for which abstract images they prefer ($r = 0.20$; Vessel & Rubin, 2010). Abstract images contain variations in low-level visual features such as color contrast and shape, but no semantic associations (i.e. they are not nameable). This suggests that preferences for real-world scenes are primarily determined by semantic associations rather than by low-level visual features, and that agreement for real-world scenes is due to learned semantic interpretations shared across observers.

The nature of the semantic information that leads to shared preferences across a set of real-world scenes has not been well characterized. By identifying sub-classes of real-world scenes that show differences in the degree to which people share similar aesthetic preferences, it is possible to further isolate aspects of internal associations that have reliable relationships to preference formation.

One of the most salient dimensions of meaning in real-world scenes is the degree of ‘naturalness’, or the comparison between natural and urban/manmade elements. Within the broad class of real-world scenes, previous research has shown that the amount of natural versus urban content is a strong predictor of preference (higher degrees of naturalness resulted in increased preference; Kaplan, 1992; Kaplan & Kaplan, 1982; Kaplan & Kaplan, 1989; Kaplan, Kaplan, & Wendt, 1972; Real, Arce, & Sabucedo, 2000; Ulrich, 1981; van den Berg, Koole, & van der Wulp, 2003; White & Gatersleben, 2011; Zube, Brush, & Fabos, 1975). This distinction is also critical for how observers understand and categorize visual stimuli: when asked to divide a set of real-world scenes into similar groups, observers (almost universally) spontaneously separate them into natural and urban/manmade categories (Olivia & Torralba, 2001). Natural and urban scenes are therefore excellent candidates for two sub-classes of real-world scenes that are likely to show differences in the nature of the information that governs the formation of aesthetic preferences.

At one end of this spectrum, natural landscapes form a well-defined domain of real-world scenes that humans regularly evaluate in an aesthetic manner – sunsets, mountain vistas, and beaches are regularly identified as “beautiful”
“sublime” or “moving.” At the other end, architectural objects such as houses and buildings also form a well-defined aesthetic domain – the structures that humans inhabit are also frequently the subject of aesthetic labels such as “beautiful,” “sublime,” or “ugly.”

Yet, even though both natural landscapes and architecture form well-defined classes of real-world scenes that are regularly regarded in an aesthetic manner, there are important differences between these stimuli that must be addressed. Differences in the features of a natural landscape may provide clues regarding habitability and resource availability, whereas differences in individual features of buildings are more likely to reflect aesthetic considerations that carry little functional significance for viewers who do not have specific architectural training or local cultural knowledge (e.g., cornice structure, roof shape, decorative designs or window contour).

If such “fitness” considerations affect preferences, then individuals should show more consistent agreement on their preferences for natural landscapes compared to architecture.

Using two image sets, one composed of natural landscapes with little/no manmade intrusions and a second set of images of exterior architecture, this experiment addressed the following two questions: a) when comparing individual’s preferences within each of these two domains (thus removing natural vs urban as a major dimension of variation), will observers still show strong agreement on which images they prefer, and b) will observers show higher agreement for which specific exemplars of architecture are preferred than for which specific exemplars of natural landscapes are preferred? We predict that images of architecture will show lower agreement across participants because differences amongst exemplars are less functionally significant and instead reflect stylistic considerations that carry little consistent meaning for naïve (non-architect) observers.

**Methods**

**Observers**

Twenty-one observers (10 male, 16 right-handed, mean age 27.84 years ±6.47) were recruited for the study. Two observers were excluded from the analysis because of low average reliability (r < 0.5) in the key press and rating tasks across blocks, leaving a total of 19 subjects.

Individuals were recruited through fliers placed throughout New York City. Each participant consented to participate in accordance with NYU human subject policies and were paid $12/hr for their participation. Observers all had normal/corrected vision and had no history of neurological or mood disorders.

**Stimuli**

Images of natural landscapes (148) and images of exterior architecture (108) were obtained from a variety of sources, including the SUN Database (Xiao et al., 2010), IMSI

![A] Examples of natural landscape images

![B] Examples of exterior architecture images

MasterClips and MasterPhotos Premium Image Collection (Novato, California, USA), ARTSTOR database (www.artstor.org), and also from publicly available images on the internet (Figure 1). The set of images was cropped in Adobe Photoshop CS3 (Adobe Systems, San Jose, CA) to fit a dimension of 640x480 voxels or 480x640 voxels (4:3 or 3:4 ratio), written out in TIFF format, and presented at a size of 13° of visual angle in the horizontal direction.

The set of images were contrast-equalized using custom code in Matlab 7.10 (MathWorks, Natick, Massachusetts). Images in both domains were processed to minimize differences in luminance contrast. This procedure was carried out by measuring the root-mean-square (RMS) contrast of each image (a measure of variance of the luminance distribution). Differences in luminance contrast across the set of images were minimized by scaling the distribution of each color channel (RGB) by the same factor to match a target luminance contrast (root-mean-square; C_{RMS}) of 0.2 (using a standard rgb-to-gray transform) when displaying images on an LCD monitor using a linearized color look-up table (CLUT).

Images and instructions were presented on a Viewsonic ViewPanel VE170 monitor using a Dell Precision T1500 computer running Windows 7 with Matlab R2011b using Psychophysics Toolbox-3 extensions (Brainard, 1997; Pelli, 1997; Kleiner, Brainard, & Pelli, 2007).

**Procedure**

Before the start of the experiment, observers completed 1) a background questionnaire composed of questions on demographic information (age, race, handedness, gender, sexuality, history of neurological illness, history of mental illness, current medication status, and artistic expertise)., 2) the Temporal Experience of Pleasure Scale (TEPS; Gard, Gard, Kring, & John, 2010) to account for an observers’ anticipation of hedonic pleasure (approach motivation) and ability to experience hedonic pleasure (initial responsiveness to reward) and 3) the State-Trait Anxiety Inventory (STAI;
Spielberger, 1983) to account for anxiety, which may also affect one’s experience of pleasure.

Subjects were instructed to fill out the aforementioned questionnaires. After completing the paperwork, participants were positioned 57 cm from the experimental monitor in a darkened room; the only source of light was the computer monitor. Observers were instructed to read the task-specific instructions and viewed a set of three to five sample images during the practice trials. Once they completed the practice trials, the experimenter left the room and observers proceeded to view all images. Images were presented in two blocks for landscape stimuli and three blocks for architecture stimuli. Order of image presentation was counterbalanced across observers to control for possible sequence effects, and the task presented first was alternated between participants. Participants were allowed to take breaks after viewing a certain number of images to stretch/rest.

Using a within-subjects design, observers’ aesthetic reaction was assessed for the natural landscape and exterior architecture images in separate sessions through two computer-based tasks, including a rating task and a key press task (Figure 2).

**Rating Task**

The rating task was used to assess preference, or ‘liking’. Participants were asked to provide their aesthetic preference for each image on a scale ranging from 1-7 on how much each image ‘moved’ them (Figure 2A). Each image was presented one at a time. During the presentation of the stimuli, a fixation point was presented for 500ms, followed by a 3s presentation of the image and finally the appearance of a rating scale which remained until participants provided a response.

**Key Press Task**

The key press task was used to assess reward value or ‘wanting’ (e.g. approach motivation). Individuals were required to exert effort by pressing keys in order to increase/decrease the amount of time that images remained on the screen to indicate how much each image ‘moved’ them (Figure 2B).

Each image was presented one at a time after the presentation of a fixation point (500ms). A Dell QWERTY keyboard (SK-8135) with the “z” and “x” keys labeled with the minus signs (“-“) and the “+” and “,” keys labeled with plus signs (“+“). Participants could alter the presentation duration of each image by rapidly alternating between the pairs of keys to decrease or increase, respectively, the total amount of time of exposure to the image. If no keys were pressed, images would remain on the screen for 4 seconds. Observers were informed that the total duration of the experiment was independent of how long they chose to view each image in order to prevent them from rushing through the experiment, yet total duration did vary based on individual responses. Previous studies have used an 8-second baseline exposure time for each image (Aharon et al., 2001; Elman et al., 2005). However, on the basis of pilot experiments, this was reduced to a 4-second baseline exposure time.

**Results**

**Mean Preferences & Mean Viewing Times**

Mean preference (rating) measures revealed no differences in aesthetic evaluations for landscapes ($M = 4.00, SD = 0.78$) versus architecture stimuli ($M = 3.88, SD = 0.66$; $t_{[18]} = 0.84$, $p = 0.414$; Figure 3). The same applies for mean viewing times; subjects viewed images of natural landscapes ($M = 4.39, SD = 0.48$) and architecture for similar durations of time ($M = 4.26, SD = 0.39$; $t_{[18]} = 1.12$, $p = 0.279$, Figure 3).

![Figure 2. A) Presentation of stimuli in rating task B) Presentation of stimuli in key press task.](image)

**Within-Subjects Reliability**

Measures of within-observer reliability across conditions revealed two subjects with low average reliability ($r < 0.5$) across the first and second blocks for the rating and key press tasks in both domains. These individuals were excluded from the rest of the analysis, leaving a total of 19 subjects.

For the rating task, reliability for the landscape stimuli ($r = 0.71 \pm 0.1$) was not significantly different to reliability values for the exterior architecture stimuli ($r = 0.70 \pm 0.13$; $t[18] = 0.53$, $p = 0.605$). Likewise, for the key press task, there were no differences in reliability between the architecture stimuli ($r = 0.64 \pm 0.17$) in comparison to the landscape stimuli ($r = 0.55 \pm 0.2$; $t[18] = -1.38$, $p = 0.185$).

**Between-Subject Agreement**

We hypothesized that agreement across subjects for a set of natural landscapes would be higher than agreement for a set of exterior architectural stimuli. To test this hypothesis, a
between-subject agreement measure was calculated for the 19 subjects by examining the correlation between one subject against the population mean. This set of observers included individuals who had been tested in both experimental domains and had high levels of reliability across blocks.

Figure 4. Higher agreement for ratings of landscapes than for images of architecture. The “mean-minus-one” correlation between each observer’s ratings and the mean ratings of all other observers was significantly higher for landscapes than architecture (solid line; *p < 0.04*). The mean-minus-one correlation between each observer’s looking times and the average looking times of all other observers in the key press task was not significantly different for landscape versus architecture stimuli (dotted line; *p < 0.27*). Error bars represent standard error of the mean.

Agreement for the rating task was indeed higher for images of natural landscapes (“mean-minus-one” measure of agreement, *r = 0.60 ±0.18*) than for images of exterior architecture (mean-minus-one *r = 0.48 ±0.18; t[36] = 2.13, *p < 0.04*; Fig. 4 solid line). However, no difference in agreement was observed for viewing times in the key press task (natural landscapes *r = 0.51 ±0.16; exterior architecture *r = 0.45 ±0.17; t[36] = 1.13, *p < 0.27* Fig. 4 dashed line).

This pattern of results is the same when no exclusion criteria was implemented (n = 21; rating: *t[40] = 2.32 , *p < 0.026) and also when different cutoff points were incorporated (rating reliability < 0.5, n = 16; *t[30] = 2.62, *p < 0.014). Even though the cutoff criteria we used showed the least robust results, they were still significant and allow us to say with confidence that our findings were not lead by low reliability measures.

Overall, these results show that observer agreement in aesthetic ratings for the landscape stimuli was higher than agreement for the architecture stimuli in the rating task, consistent with our predictions.

**Discussion**

We found that there was a significantly higher degree of shared preferences for natural landscapes over images of exterior architecture for the rating task. No significant difference was found for the key press task, yet agreement did seem to be slightly lower for architecture stimuli than landscapes. Importantly, the differences in agreement for the rating task were not an effect of reduced reliability for the architecture images – reliability on the rating task was similarly high for both categories.

A similar result was found in a between-subjects test across several stimulus domains, where agreement was highest for faces (*r = .81 ±.13*), followed by natural landscapes (*r = .64 ±.19*), architecture (*r = .40 ±.17*), and finally artwork (*r = .25 ± .16* (Vessel et al, 2014). The results presented here, using a more powerful within-subjects design, provide strong converging evidence that higher or lower agreement for across categories of images reflect underlying differences in the nature of aesthetic preference formation. Taken together, these results suggest that preferences for fitness-related categories of images (e.g., faces and landscapes) come to rely on similar features across individuals, whereas preferences for artifacts of human culture (e.g., architecture and artwork) may rely on more individual aesthetic considerations that carry little functional significance to non-expert viewers. Therefore, we conclude that fitness-relevant information present (to a much larger degree) in images of natural landscapes may be interpreted in a similar manner across individuals and drive agreement across images. The dense body of literature that has examined preference from an evolutionary approach (Appleton, 1975; Kaplan, 1992; Kaplan & Kaplan, 1989; Orians & Heerwagen, 1992; Ulrich, 1993) provides additional support for this hypothesis.

A second, potentially related explanation concerns the number of “basic-level” semantic categorical descriptors that a non-expert can use to categorize landscapes versus architecture stimuli (see Rosch, 1975). Basic level categories refer to the level of categorization with the highest level of ‘cue validity’, or in other words the most straight-forward or prototypical semantic descriptor for a stimulus. Natural landscapes have a greater number of basic-level semantic descriptors (e.g., lake, river, forest, farmland, desert, island, mountains, swamp, coast, etc.) in comparison to scenes of exterior architecture (e.g., building, house, church, school). Categories of images with a greater number of basic-level categorical distinctions may show more consistent preferences across people because one can make more distinctions amongst exemplars of a category. Because a non-expert has a more limited semantic toolbox through which to classify architectural stimuli, variations in individual interpretations may rely on a more personalized set of attributes that are more culturally related and bound to subjective interpretations, thus decreasing agreement across these stimuli. However, it is unlikely that this explanation would hold as a universal principle. Faces, for example, form an aesthetic domain with very few basic-level category distinctions, yet there is very strong agreement across people for attractiveness judgments of faces. Ultimately, a purely “aesthetic” evaluation of an image may be the case when there is a lack of fitness-relevant information associated with a stimulus category.
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Automaticity, Cognitive Effort, and Preference for Visual Art
Aesthetics of Metaphor: Aptness and Beauty Considered

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Abstract
What makes a “good” metaphor? Is it its inherent aptness? What makes a metaphor beautiful? Previous research has suggested that aptness and beauty of a metaphor are one and the same (Katz, 1989). We tested this hypothesis in 2 studies. Native English speakers rated metaphors on aptness (Study 1; N=20) and subjective beauty (Study 2; N=20). Results revealed that beauty and aptness are not correlated (Pearson r=0.056, p=0.336). Moreover, aptness and beauty ratings were predicted by different sentence-level variables. Aptness rating was mediated by familiarity, or previous exposure to the metaphor. Beauty ratings were related to valence and figurativeness of the metaphor. These findings are not consistent with the hypothesis that beauty and aptness are interrelated.

Keywords: metaphor; figurative language; beauty; aptness.

Introduction
The oft quoted final lines of “Ode on a Grecian Urn,” one of John Keats’ most famous poems, read, “Beauty is truth, truth beauty,—that is all / Ye know on earth, and all ye need to know.” While literary critics have long debated what Keats actually meant when he penned these words, the notions of truth and beauty seem intimately intertwined. One proposal might be that if a work of art is beautiful enough, it creates its own truth. Or, in order for a work of art to be beautiful it must successfully capture some truth in the world.

While beauty is most readily associated with perception of primarily visual entities, such as visual art, human forms, and natural vistas, beauty is, in fact, a broad concept that is often applied to non-visual entities, as well, including music, mathematical proofs, literature, and rhetorical speech (Chatterjee, 2014).

Metaphors extend our thinking by creating links between dissimilar conceptual domains. A successful, or “good” novel metaphor accomplishes this by highlighting characteristics between the source concept and its target. For example, to understand, “His children were his heartbeat,” the reader applies attributes of the source concept “heartbeat” (e.g. steady, lifelong, source of life) onto the target (children). The ease with which the reader accomplishes this can be quantified, and is called ‘aptness’ (Chiappe & Kennedy, 1999; Jones & Estes, 2005, 2006).

Do readers consider highly apt metaphors more beautiful than less apt metaphors? Previous researchers have assumed that the aptness of a metaphor is inextricably linked to its beauty. For example, in a ratings experiment of metaphors, Katz, Paivio, Marschar & Clark (1988) instructed participants to rate metaphors’ “aptness” by paraphrasing it with “pleasing.” In a later study Katz expanded the definition of aptness to “pleasing, poetic, surprising.” (1989).

A study by Bohn, Altmann, Lubrich, Menninghaus & Jacobs (2013) had participants rate familiar proverbs and variants of proverbs on their beauty from 1 (not beautiful at all) to 7 (very beautiful). Their instructions were that ratings take into account “stylistic quality, pleasantness, but also approval of the social or moral value implied in a proverb.” The final component, “approval of the social or moral value,” may relate more to the aptness of the proverb than to its beauty. This provides another example of a common but untested assumption that beauty and aptness are intrinsically linked.

Characteristics of metaphors such as familiarity, figurativeness, imageability, interpretability and overall valence can influence comprehension of metaphors. The “career of metaphor” hypothesis, proposed by Bowdle and Gentner (2005) suggests that as a metaphor becomes more familiar, or less novel, it may also be perceived as less figurative, or more like a literal sentence. For example, a more familiar and conventionalized metaphor such as, “His children were his life,” would be further along in its metaphoric ‘career’ because readers have encountered this idea many times before. The model suggests the metaphor loses some of its figurativeness as it gains familiarity. It would thus be read more like a literal sentence. This “career of metaphor” theory might predict a positive relationship between familiarity and aptness rating, where familiar metaphors would be perceived as highly apt. It might also predict a negative relationship between figurativeness and
aptness, where highly figurative metaphors would be considered not very apt.

Beauty, especially in literature, is not easy to define because of its inherent subjectivity. However, it too has been found to be influenced by familiarity. Previous research has suggested that familiarity might even be falsely attributed to preferred items (Monin, 2003). In their 2012 rating experiment, Bohn and colleagues found a moderate correlation between beauty and familiarity of proverbs (Bohn et al., 2012). Since proverbs are short, stand-alone pieces of writing, much like the nominal metaphors considered in the present study, we predicted beauty of metaphors would be positively correlated with familiarity.

The present study investigated the relationship between aptness and beauty of metaphors. They also endeavored to delineate the extent to which other sentence-level characteristics, specifically, familiarity, imageability, figurativeness, interpretability, and valence, can explain the variance in people’s judgments of aptness and beauty. To accomplish this, aptness (Study 1) and beauty (Study 2) ratings were collected on nominal metaphors and compared to ratings on the aforementioned other parameters for the same group of nominal metaphors.

If aptness and beauty are indeed tightly related, then metaphors that are rated as highly apt would also be rated as highly beautiful. Aptness and beauty ratings might also be predicted by similar sentence-level characteristics. If aptness and beauty have a negative correlation or no correlation, and are predicted by different characteristics, then this would debunk previous assumptions.

**Study 1: Aptness Ratings**

Previous research has suggested that metaphor “goodness” is linked to other characteristics of the sentence. Katz et al. (1988) found a positive correlation between aptness and familiarity, comprehensibility, ease of interpretation, degree of metaphoricity, and imagery. However, as previously noted, their definition of aptness was conflated with subjective pleasure rating. Study 1 dissociates aptness from subjective pleasure judgment by asking participants to rate “the extent to which the metaphor’s source concept captures important qualities of the metaphor’s target concept.”

**Methods**

**Participants** Twenty college-age participants were recruited from the University of Pennsylvania community in compliance with procedures established by the university’s Institutional Review Board. They were native speakers of English with a mean age of 19.2 years (SD=1.2).

**Stimuli** 296 nominal metaphors developed and normed in Cardillo, Schmidt, Kranjec, & Chatterjee (2010) were rated on aptness. Ratings on multiple sentence-level characteristics, including familiarity, figurativeness, imageability, interpretability, and valence positive ratio, were used in the analysis for the present study. Familiarity ratings were obtained by asking participants to rate the “frequency of experience with the sentence and its meaning” for each metaphor on a scale from 1 (very unfamiliar) to 7 (very familiar). Figurativeness ratings were obtained by asking participants to rate “how literal of an interpretation each sentence suggested” on a scale from 1 (very literal) to 7 (very figurative). Imageability ratings were obtained by asking participants to rate “how quickly and easily each sentence brought a visual image to mind” on a scale from 1 (no image) to 7 (clear, immediate image). Interpretability ratings were obtained by asking participants to write an interpretation of each sentence. To generate an interpretability score for each item, the number of interpretations deemed plausible by at least 2 of 3 independent judges was divided by the total number of interpretations for that item. Valence positive ratio was calculated by asking each participant to categorize the emotional valence of each sentence as “positive valence” or “negative or neutral valence.” The resulting percentage of positive valence rating is the “valence positive ratio.”

**Procedure** Participants were tested individually in a session lasting less than one hour. Instructions with 4 examples were provided. Participants were asked to rate each of the 296 metaphors for aptness on a 7-point Likert scale (1= low aptness; 7= high aptness). Items were presented in random order on a computer screen. Aptness was defined as “the extent to which the metaphor’s source concept captures important qualities of the metaphor’s target concept.”

**Results**

The mean aptness rating for the 296 nominal metaphors was 4.00 (SD=1.68; min: 1.65; max: 6.25). A correlation matrix (Table 1) delineates the relationship between metaphor aptness and beauty, as well as the previously ascertained metaphor characteristics from Cardillo et al. (2010). Aptness was positively and significantly correlated with familiarity (Pearson $r=0.741$, $p<0.0005$), imageability (Pearson $r=0.472$, $p<0.0005$), and interpretability (Pearson $r=0.427$, $p<0.0005$). Aptness was negatively and significantly correlated with figurativeness (Pearson $r=-0.141$, $p=0.015$). There was no significant correlation between metaphor aptness and valence positive ratio.

A multiple regression analysis was performed to determine the extent to which sentence-level characteristics explained variance in aptness. Familiarity, imageability, interpretability, and figurativeness were included in this analysis, as these four parameters were significantly correlated with aptness. The analysis indicated that 58.9% (the adjusted R-squared value) of the variance in metaphor aptness was explained by familiarity ($\beta=0.667$, p<0.0005), interpretability ($\beta=0.135$, p=0.001), imageability ($\beta=0.121$, p=0.005), and figurativeness ($\beta=0.100$, p=0.013). Semi-partial correlation statistics revealed, however, that familiarity was the only predictor variable that made a large unique contribution to the overall variance in aptness (Table 2). Familiarity accounted for 25.8% of the variance in aptness on its own, while interpretability, imageability, and figurativeness made smaller, though significant, unique
contributions to the overall variance in aptness (2.85%, 1.93%, and 1.82%, respectively).

Discussion of Aptness
As suggested by the “career of metaphor” hypothesis, more familiar metaphors tended to be rated as highly apt. Moreover, familiarity was the only predictor variable to make a large, unique contribution to the variance in aptness ratings (25.8%). The significant (though weak) negative correlation between aptness and figurativeness also supports Bowdle and Gentner’s hypothesis (2005). It indicates that highly apt metaphors tended to be rated as less figurative. Said differently, highly apt metaphors were perceived as more literal. The figurative meaning of the sentence may be so accessible in ‘high aptness’ metaphors that they may be read as literal.

The significant positive correlations between aptness and imageability, and aptness and interpretability indicate that highly apt metaphors also tended to conjure strong visual images and were more easily interpretable. Formation of a mental image in response to reading a sentence may indicate some degree of linguistic success. English teachers have long maintained that one key to good writing is, “Show; don’t tell.” Not unsurprisingly, imageability and interpretability were also correlated with one another (Pearson r=0.338, p<0.0005).

The general correlation findings, however, were somewhat undercut by the semi-partial correlations analysis. This analysis indicated that interpretability, imageability, and figurativeness accounted for less than 3% of the overall variance in aptness. Previous exposure to the metaphor was the best unique predictor of aptness rating.

It may be the case that familiarity with a metaphor establishes the relationship between source and target concepts, thus making it seem more apt. However, it is possible that highly apt metaphors resonate with the reader and engender a sense of familiarity even if it has never been encountered before. In this case, the source and target concepts may be so easily linked that the sentence may already seem familiar. Alternatively, highly apt metaphors may be more likely to enter the lexicon and become more familiar and conventionalized because they are more “successful” than less apt metaphors.

Study 2: Beauty Ratings
Some metaphors are more beautiful than others, but little is known about the sentence-level characteristics that influence the perceived beauty of metaphors. Are highly figurative metaphors considered more aesthetically pleasing? Cardillo et al. (2010) found that figurativeness and familiarity were negatively correlated. Will highly figurative, unfamiliar metaphors be judged as more beautiful? Or do we tend to like what we know, as suggested by Bohn et al.’s study of proverbs (2012)?

Methods
Participants Twenty college-age participants, who were not enrolled in the aptness study, were recruited from the University of Pennsylvania community in compliance with procedures established by the university’s Institutional Review Board. They were native speakers of English with a mean age of 19.2 years (SD=1.0).

Stimuli The same 296 metaphors that were rated for aptness in Study 1 were used in Study 2.

Procedure Participants were tested individually in a session lasting less than one hour. Instructions with 3 examples were provided. Participants were asked to rate each of the 296 metaphors for beauty on a 7-point Likert scale (1= not beautiful at all; 7 = very beautiful). Items were presented in random order on a computer screen. The subjectivity of the ratings was emphasized (e.g. “There is no right answer.”)

Results
The beauty ratings of the 296 nominal metaphors were analyzed in the same way as in Study 1. The mean beauty rating was 3.17 (SD=1.55; min: 1.65; max: 6.25). Table 1 shows the relationship between metaphor beauty and aptness, as well as the previously ascertained metaphor characteristics from Cardillo et al. (2010). Beauty was positively and significantly correlated with valence positive ratio (Pearson r=0.395, p<0.0005), figurativeness (Pearson r=0.290, p<0.0005), imageability (Pearson r=0.217, p<0.0005). There was no significant correlation between beauty of a metaphor and familiarity or interpretability.

A multiple regression analysis was performed to determine the extent to which sentence-level characteristics explained variance in beauty (Table 3). Valence positive ratio, figurativeness, and imageability were included in this analysis, as these three parameters were significantly correlated with beauty ratings. The analysis indicated that 27.3% (the adjusted R-squared value) of the variance in metaphor beauty was explained by valence positive ratio (β=0.390, p<0.0005), figurativeness (β=0.326, p<0.0005), and imageability (β=0.145, p=0.005). Semi-partial correlation statistics revealed that both valence positive ratio and figurativeness made sizeable unique contributions to the overall variance in beauty ratings. Valence positive ratio accounted for 15.8% of the variance in beauty on its own, while figurativeness accounted for 12.7%. Imageability made a much smaller unique contribution (2.59%).

Discussion of Beauty
The present study did not find a significant relationship between familiarity and beauty of metaphors. Our results do not support the “we like what we know” hypothesis proposed by Bohn et al. (2013). Metaphor processing may be fundamentally different from that of proverbs. The stimuli used in the present study were designed to be novel and relatively unfamiliar whereas some of the stimuli included in Bohn et al. (2013) were familiar proverbs. Additionally, the
moralistic meaning of the proverb may have influenced the beauty ratings. Proverbs relaying a more positive message may have been rated as more beautiful.

The present study found a significant, positive correlation between beauty and positive valence ratio, figurativeness, and imageability, where positive valence ratio uniquely accounted for 15.8% of the variance in beauty ratings. The positive correlation between beauty and figurativeness suggests the reader was aware of the presence of a metaphorical comparison when rating metaphors. Low figurativeness ratings indicate that the metaphor may have been considered mundane and perceived as essentially literal. Highly figurative metaphors may seem more artful, whereas minimally figurative metaphors may seem like ordinary speech. Approximately 13% of the variance in figurativeness was uniquely accounted for by figurativeness ratings.

The significant correlation between beauty and imageability indicates that highly beautiful metaphors also tended to conjure strong visual images. Though the association is somewhat undercut by the finding that imageability uniquely accounted for only 2.59% of the variance in beauty ratings, the association is intuitively sensible nonetheless.

This positive relationship between sentences that were perceived as emotionally positive and beauty suggests participants may have responded to the sentiment of the meaning of the sentence.

**General Discussion**

This study investigated the relationship between the aptness and beauty of metaphor and investigated the extent to which other sentence level characteristics (specifically, familiarity, figurativeness, imageability, interpretability, and valence) contribute to aptness and beauty. Most notably, our results suggest a complete dissociation of aptness and beauty. This orthogonal relationship contradicts previous assumptions made by Katz and colleagues (1988; 1989). Moreover, the correlation matrix and multiple regression analyses revealed that aptness and beauty were not predicted by the same sentential variables. Familiarity and interpretability positively influenced the rating of aptness, but were irrelevant to beauty. Positive valence, on the other hand, predicted beauty rating and had no bearing on aptness. Interestingly, both beauty and aptness were correlated with figurativeness, but with associations in opposite directions. More figurative metaphors were rated as highly beautiful and were judged as less apt.

If, as suggested by Bowdle and Gentner (2005), the subjective sense of figurativeness demarcates a metaphor’s position along its career arc, then these findings suggest that aptness may be associated with progression along the trajectory of the career of metaphor. As a group, our metaphors were relatively unfamiliar. There may be a “sweet spot” in the career of metaphors, where they seem more apt. An alternate hypothesis would be that apt metaphors feel more familiar even when encountered for the first time.

Beauty, on the other hand, may not be linked to career trajectory of a metaphor.

Metaphors that expressed positive sentiments and were judged to be more figurative were regarded as more beautiful. Our participants seem to be responding to the meaning of the sentence in experiencing beauty. The figurativeness influence on beauty may have been a context effect. In the same way that a visual image labeled as being from a gallery is preferred over the same image as labeled as being randomly generated (Kirk, Skov, Hulme, Christiansen & Zeki, 2009), the figurativeness of a sentence might label it as “literary.”

Aptness and beauty were positively and significantly associated with imageability. This suggests that metaphors that easily conjure up visual imagery are both more aesthetically pleasing and more effective at capturing salient features of the concepts being expressed.

Sentence-level characteristics included in the multivariable regression analysis explained 58.9% of the variance in aptness ratings but only 27.3% of the variance in beauty ratings. This suggests that aptness is much more strongly related to other known, measured objective parameters of sentences than beauty. These results support the idea that aptness is fundamentally a more objective concept, while beauty is fundamentally a more subjective concept.

Discussions in visual art recognize the distinction between form and content. Our study finds that people’s evaluations of metaphors are differentially influenced by the form and content of sentences. Aptness was primarily accounted for by a relational property— the extent to which attributes of the source were applied to the target— a judgment of the underlying form of the metaphor. By contrast, beauty was accounted for by the emotional valence of the sentence— a judgment of the content of the metaphor. Reactions to content, in general, are influenced by people’s personal and cultural histories (Chatterjee & Vartanian, 2014), and are likely to be more varied than reactions to form, as we found in our study.

College undergraduate students might be regarded as naïve literary readers. That is, they are not expert like poets or literary critics. Preferences in visual art tend to be influenced by expertise. Naïve viewers respond to the content of images, while experts are more sensitive to the form of images (Leder, Belke, Oeberst & Augustin, 2004). If these dynamics observed in visual art also apply to literary arts, we predict that literary experts might be more sensitive to the formal properties of sentences and in this population judgments of aptness and beauty would converge.

**Conclusion**

Despite a prevailing assumption that the metaphor beauty and aptness are intricately intertwined, these ratings studies of 296 nominal metaphors revealed an orthogonal relationship between the parameters. Beauty and truth may be one and the same to John Keats, but they seem to be different when it comes to evaluating metaphors. Aptness may relate to the form of metaphors and beauty to the content of the sentence.
Table 1: Sentence-level characteristics correlation matrix
Note: Top number in each box is Pearson r. Bottom number is p-value.

<table>
<thead>
<tr>
<th></th>
<th>Aptness</th>
<th>Beauty</th>
<th>Familiarity</th>
<th>Figurative-ness</th>
<th>Imageability</th>
<th>Interpretability</th>
<th>Valence (+) ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aptness</td>
<td>1</td>
<td>0.056</td>
<td>0.741</td>
<td>-0.141</td>
<td>0.472</td>
<td>0.427</td>
<td>0.032</td>
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<tr>
<td></td>
<td></td>
<td>(0.336)</td>
<td>(&lt;0.0005)</td>
<td>(0.015)</td>
<td>(&lt;0.0005)</td>
<td>(&lt;0.0005)</td>
<td>(0.588)</td>
</tr>
<tr>
<td>Beauty</td>
<td>1</td>
<td>0.023</td>
<td>0.290</td>
<td>0.217</td>
<td>0.012</td>
<td>0.395</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.688)</td>
<td>(&lt;0.0005)</td>
<td>(0.833)</td>
<td>(0.833)</td>
<td>(&lt;0.0005)</td>
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<tr>
<td>Familiarity</td>
<td>1</td>
<td>0.667</td>
<td>-0.339</td>
<td>0.464</td>
<td>0.389</td>
<td>0.130</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.314)</td>
<td>(&lt;0.0005)</td>
<td>(&lt;0.0005)</td>
<td>(&lt;0.0005)</td>
<td>(0.025)</td>
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</tr>
<tr>
<td>Figurativeness</td>
<td>1</td>
<td>-0.038</td>
<td>0.338</td>
<td>0.215</td>
<td>0.161</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.520)</td>
<td>(&lt;0.0005)</td>
<td>(&lt;0.0005)</td>
<td>(0.163)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Imageability</td>
<td>1</td>
<td>0.145</td>
<td>0.0210</td>
<td>0.135</td>
<td>0.0182</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.457)</td>
<td>0.0210</td>
<td>0.135</td>
<td>0.0182</td>
<td></td>
<td></td>
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<tr>
<td>Interpretability</td>
<td>1</td>
<td>0.390</td>
<td>0.409</td>
<td>0.167</td>
<td>0.398</td>
<td>0.158</td>
<td>&lt;0.0005</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.409)</td>
<td>0.167</td>
<td>0.398</td>
<td>0.158</td>
<td></td>
<td>&lt;0.0005</td>
</tr>
<tr>
<td>Valence (+) ratio</td>
<td>1</td>
<td>0.390</td>
<td>0.409</td>
<td>0.167</td>
<td>0.398</td>
<td>0.158</td>
<td>&lt;0.0005</td>
</tr>
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</table>

Table 2: Aptness -- β values and partial correlation and semi-partial correlation statistics

<table>
<thead>
<tr>
<th>Predictor variable</th>
<th>Standardized coefficient: β</th>
<th>Partial correlation</th>
<th>Partial correlation squared</th>
<th>Semi-partial correlation</th>
<th>Squared semi-partial correlation</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Familiarity</td>
<td>0.667</td>
<td>0.639</td>
<td>0.408</td>
<td>0.508</td>
<td>0.258</td>
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<td>Interpretability</td>
<td>0.135</td>
<td>0.188</td>
<td>0.0353</td>
<td>0.169</td>
<td>0.0285</td>
<td>0.001</td>
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<td>Imageability</td>
<td>0.121</td>
<td>0.162</td>
<td>0.0262</td>
<td>0.139</td>
<td>0.0193</td>
<td>0.005</td>
</tr>
<tr>
<td>Figurativeness</td>
<td>0.100</td>
<td>0.145</td>
<td>0.0210</td>
<td>0.135</td>
<td>0.0182</td>
<td>0.013</td>
</tr>
</tbody>
</table>

Table 3: Beauty -- β values and partial correlation and semi-partial correlation statistics

<table>
<thead>
<tr>
<th>Predictor variable</th>
<th>Standardized coefficient: β</th>
<th>Partial correlation</th>
<th>Partial correlation squared</th>
<th>Semi-partial correlation</th>
<th>Squared semi-partial correlation</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valence (+) ratio</td>
<td>0.390</td>
<td>0.409</td>
<td>0.167</td>
<td>0.398</td>
<td>0.158</td>
<td>&lt;0.0005</td>
</tr>
<tr>
<td>Figurativeness</td>
<td>0.326</td>
<td>0.358</td>
<td>0.128</td>
<td>0.357</td>
<td>0.127</td>
<td>&lt;0.0005</td>
</tr>
<tr>
<td>Imageability</td>
<td>0.145</td>
<td>0.165</td>
<td>0.0272</td>
<td>0.161</td>
<td>0.0259</td>
<td>0.005</td>
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</table>
Acknowledgments
This research was supported by a National Institute of Health grant (R01-DC012511) awarded to A. Chatterjee, and National Institute of Health training grant (T32AG000255-16). Thanks to Alex Yu and Jon Yu for helping collect the data. Thanks to Eileen Cardillo, Gwenda Schmidt, Alex Kranjec and Anjan Chatterjee for the use of their metaphors and norming data. Special thanks to labmate and “metaphor mastermind,” Eileen Cardillo.

References
Navigation System Generates Story of Nagasaki City

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Abstract
Nagasaki LRT Navigation Promotion Council provides the Service named DOKONE. It distributes the position information of the low-floor vehicle operated by Nagasaki Electric Tramway to the mobile terminal. This system detects tram and user's positions by GPS, and transmits data via mobile network. Users can determine the position of the tram by the map displayed on the mobile phone. In addition, they can reserve getting on from a specific stop. This service started in 2011, and reached 40,000 by the number of accesses. We developed a new navigation system for sightseeing that used GPS, Bluetooth and the NFC tag based on DOKONE in 2012. This article reports on the process of the evolution of the navigator and text of city.

Keywords: Narrative theory; ITS (Intelligent Transport System) for Sightseeing; Smart Phone Navigation; LRT (Light Rail Transit); GPS (Global Positioning System); NFC (Near Field Communication).

Nagasaki city and Tram
Nagasaki city is one of the most popular tourist towns on the west edge of Japan. Because it was the only overseas trade port of the period of national isolation (1639-1854), this city has prospered as a window of Western culture in Japan until the 19th century. Nagasaki city was a territory of Society of Jesus in the 16th century. And, World War II ended by the atomic bombing to Nagasaki. It has been used as familiar transportation by the citizens and the tourist today though the tram received big damage in the war. Nagasaki Electric Tramway operates the tram of 11.5km in the total extension in the Nagasaki City. The number of stops is 39 places, and the number of vehicles is 79. Among these there are 5 low-floor vehicles. Because the driving spacing is very short, Nagasaki Electric Tramway doesn't maintain the timetable. The user doesn't understand when the low-floor car arrives at the stop from such circumstances. As a consignment business of the Ministry of Land, Infrastructure and Transport we started the GPS (Global Positioning System) location system of the low-floor car for the wheelchair and the stroller user at October 7, 2011 named DOKONE. This word is a meaning "Where are you?" in the Nagasaki dialect. We have formed the Nagasaki LRT Navigation Promotion Council composed by University of Nagasaki, Nagasaki Electric Tramway, Ougiseiko Co. Ltd., and local governments (Nagasaki City and Nagasaki Prefecture). This system has been used for not only the handicapped person but also the tourist. A lot of convenient sightseeing information is being offered by this system.

Narrative of the city
This research discusses the generation method of the narrative text linked with geographic space data. First, analysis methods for the existing folk tale text are described. It is clarified that there is geographic bias in the narrative text. Next, the technique for using geographic space data for the sightseeing tour is described. The sightseeing tour is an action for the tourist to touch the narrative text in the local area while moving. We maintained the place that related to the text as geographic space data. The text including place information code can be plotted on the digital map. We propose a new expression technique of the story text by integrating these methods. We have a model drawing of the expandability of the geographic information database. The possibility of linking with various texts that exist in the society is shown.

Navigation system for text generation
These two kinds of extension methods will be integrated. The mode of expression of contents that assume the node of the real world and the text to be geographic space information is scheduled to be developed. We developed a new location system for sightseeing (DOKONE II) based on DOKONE in 2013. And, we constructed a new navigation system that used three kinds of sensors (GPS: long range, Bluetooth: middle range, Near Field Communication: short range) and enabled the transit of the stroll road and the tram. It is scheduled to connect with the integrated tourism information platform in Nagasaki Prefecture. We explain the story of Nagasaki city generated with navigation system.

Developing the city for text generation
To urge the reactivation of the city core, the Nagasaki city public office promotes "city core (Machinaka) business project". The signature board shown in Figure 1 is laid to the road that passes the city core put from Shindaikumachi (north area) to Ouramachi (south area) by 45 places as the part. This signature board is laid to the intersection. (Figure 2) These are guideposts to the sightseeing spot scattered from the intersection in the river side and mountain side. The geographic data (latitude, longitude) of 45 signature boards was measured by using GPS. In addition, the correction by the city planning map etc. was given to the actual measurement value. These data was registered to Geographical Survey Institute as place information code.
Figure 1: Nagasaki-index.

Figure 2: City core road (red line).

Installation of position information sensor
The GPS sensor is mounted to most mobile phones and smart phones. The user learns his geographical location by using the measurement result of GPS. GPS is a mechanism that the position of the user is measured by using the space satellite. Therefore, an excellent positional measurement becomes possible in outdoor. However, accuracy lowers to the indoor positional measurement. Then, the system that switched the sensor used according to the distance to the destination was designed. Bluetooth mounted to all almost smart phones can control a throw according to strength of the output. We adopted Class2 (10m), and achieved navigation in the short distance. There is NFC as a sensor of a shorter distance. However, the smart phone terminal that can read the NFC tag now is few. Then, the mechanism that peripheral sightseeing information was able to be acquired by bringing the NFC tag close to the tablet terminal set up in the window of tourist facilities and the store was designed.

Table 1: Characteristics of field communication technology.

<table>
<thead>
<tr>
<th>Sensor</th>
<th>GPS (long range: 20m-km more)</th>
<th>Bluetooth (middle range: 1-20m)</th>
<th>NFC (short range: less than 0.1m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usage</td>
<td>Verifies by the application program connected with the integrated tourism information platform.</td>
<td>Verifies the notice assignment possibility of information in the surrounding, and the Navigation to facilities.</td>
<td>Verifies the possibility of the information service corresponding to the user.</td>
</tr>
</tbody>
</table>

Feature of system
We developed the application of 2 varieties. It is an application that has the navigation functions using GPS and Bluetooth, and an application that has the navigation function using NFC.

1. Navigation using GPS and Bluetooth
This is an application installed in the smart phone that the tourist owns. Position information with a GPS sensor is measured when this application is started, and the retrieval of peripheral Bluetooth master station begins. The application acquires position information in the one minute interval, and indicates the present place with the icon. This function can display the present place at the center of the map screen. However, the setting was released because it was unsuitable for the confirmation of peripheral sightseeing information in same display. The application displays GoogleMap that piles up the present place (point information), the name of street (line information), machinaka-index (point information), and machinaka-jiku (line information), on the screen. Figure 1 shows the screen of the application during starting. When the street (line information) on the map is selected, detailed information (historical origin etc.) is displayed on the screen.
The existence of information in the surrounding is notified to the user according to the vibration when user's terminal approaches Bluetooth master station shown in Figure 5. Peripheral sightseeing information is displayed on the screen of the terminal at the same time. Figure 6 shows the peripheral information display screen.

2. Navigation using NFC
This application is installed in the tablet terminal set up in sightseeing spots and the store. Because this started by holding up the NFC tag, a special icon was not created.

<Use first time>
When the NFC tag (Figure 7) is brought close to the terminal that installs the application, the personal information (sex, age, home, and interesting category) registration screen (Figure 8) is displayed.
When the user inputs a necessary matter, data is registered in the server. Next, peripheral sightseeing information that corresponds to the category with the user's interest is displayed on the terminal screen. Figure 9 shows the sightseeing information screen displayed in the terminal. This screen changes the display contents according to the category that the user input at the registration screen.

<The second times and afterwards>
When the NFC tag is brought close to the terminal that installs the application, the server displays user's current position on GoogleMap. Peripheral sightseeing information that corresponds to an interesting category is displayed on the terminal screen at the same time.

**ddNavigation system for text generation**

The text in the city and the joint of the geographic data have already been reported in Morita (2013). The object that involves the text such as the explanation or the legend of bronze statues, buildings concerning, and the sightseeing spot is linked with the geographic data and disposed on the map. The vehicle position information notice assignment system of transport links has been enhanced for sightseeing as shown in Figure 11. In addition, the sightseeing spot is plotted on the map, and the text that relates is displayed by pop up. As a result, it is Web service that transport links and the text of city can connect, and it cross-refer to literally.

**Conclusion**

It was a technique for the link of an existing text to the GPS data of a sightseeing spot concerned and writing on the map that showed in Morita (2013). This is so to speak static text generation. On the other hand, the movement of the place is accompanied, and it can be located to the dynamic text generation generated in the place and a time restriction that changes ceaselessly to have shown in Figure 12. It is a text to which the tag of time and the space is put up though the text generated here is only a tweet of the fact like the fixed form sentence. The poetic language and the daily conversation are obviously different. We think that we can enhance such a text concept. After the elaboration will be done in the future, a formal proposal is scheduled.
Figure 10: The model of the city infrastructure.

References

Figure 11: Screen shot (PC mode) of the positioning system with text (pedestrian support information) display function.

Figure 12: Screen shot (PC mode) of the positioning system with text (sightseeing information) display function.
Figure 13: Text generation experiment under movement.

Figure 14: The information service by multimodal interface is also possible.
Automaticity, Cognitive Effort, and Preference for Visual Art

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Abstract
A series of studies are summarized that examine the cognitive processes involved in aesthetic appreciation of art. Cognitive processing is approached from a dual-processing perspective of automatic and controlled processes. The findings suggest that naïve viewers of art use an automatic processing mode when making preference judgments for artistic photographs. The degree of cognitive flexibility possessed by the viewer has little effect on their judgments. However, when instructions and facial expression are manipulated during the judgment task, a switch to controlled processing begins to occur. The results are discussed within the context of naïve viewers of art versus those with experience or training with art.

Keywords: Aesthetic appreciation; cognitive processes; dual processing; preference judgments.

Background
When a person approaches a work of visual art and looks at it, a complex set of events unfolds. Sensory/perceptual processes pull out visual information, classification and categorization processes are engaged, arousal occurs, emotional reactions are generated, and contextual information from long-term memory and the physical environment the viewer occupies is processed. The end result of these events is that the person experiences a subjective reaction to the artwork along with an impression that may be left in their mind for a period of time. This impression is also affected by their personality, their experience and training with art, the purpose for viewing the artwork, and even the people they are with when they see the art. Given the large number of factors involved in this scenario, and given the complexity of how these factors interact, characterizing what goes on inside the mind of a viewer of visual art can appear a daunting task. However, since the time of Berlyne (1971, 1974), the field of experimental aesthetics has grown by leaps and bounds. Today we have many experimental methodologies available to us that allow us to examine these factors in great depth.

In the work discussed here, the focus is on delineating the cognitive processing mechanisms that factor into aesthetic experience. Leder et al. (2004) proposed a comprehensive model of aesthetic appreciation and judgment based on cognitive information processing stages. They described how aesthetic judgments are produced by cognitive processes and how aesthetic emotions are produced as a byproduct of these processes. Their model focuses on the perceptual, memory, classification and categorization, and cognitive mastering processes involved. In our recent work, my colleagues and I have taken a slightly different perspective. The conceptual framework we operate from is dual-processing theory (Evans, 2008; Evans & Stanovich, 2013). Although dual processing means different things to different people, and although different terms may be used to denote these processes (e.g., System 1 and System 2, see Alter, Oppenheimer, Epley, & Eyre, 2007; Kahneman, 2011), the general idea is that there are two theoretically and neurologically distinct cognitive processing systems in the human brain that handle information from the environment in different ways. In our work, we assume that two modes of processing are available for cognitive operations: Automatic processes and controlled processes. Automatic processes are cognitive processes that are fast, effortless, and occur mostly out of awareness. Controlled cognitive processes are slow, conscious, and effortful. Frequently encountered stimuli and highly practiced tasks tend to be handled via automatic processes, while novel stimuli and effort-intensive tasks tend to be handled via controlled processes. Top-down control processes in the cognitive system allow people to “mode switch” back and forth between automatic and controlled processes depending on the environmental conditions and the task demands that are present.

Dual processing concepts have proved useful in understanding the creative process (Vartanian, 2009; Zabelina & Robinson, 2010). They have also been invoked to explain some aspects of aesthetic appreciation (Hekkert, Snelders, & van Wierington, 2003). For example, in a study examining aesthetic preference for consumer products, Hekkert et al. (2003) found that typicality and novelty affected people’s preferences. They suggested that typicality effects reflected the operation of an automatic, adaptive mechanism that handles highly typical, frequently encountered stimuli. On the other hand, novelty effects were hypothesized to reflect the processing of atypical stimuli via a controlled, cognitively intensive mechanism. In their study, the aesthetic preferences exhibited by people were shown to be a product of the two types of processes at work.

The work described below is indebted to the seminal work on attention and dual processing conducted by Schneider & Shiffrin (1977; Shiffrin & Schneider, 1977) and others (Hasher & Zacks, 1979; Treisman & Gelade, 1980). These classic studies focused on the relationship between cognitive processing mode and utilization of attentional resources to process stimuli in the environment. In our program of research, we view automatic and controlled processes through the lens of attentional theory. The studies below represent converging methodologies that assess whether automatic or controlled processes are used when viewing visual art and making judgments about it. In one study, an experimental paradigm indexing the use of automatic or controlled processes was employed to ascertain the cognitive


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processing mode used when viewers made preference judgments about visual art. In two subsequent studies, individual differences in mode switching ability and whether viewers can be induced to adopt a controlled processing mode while judging visual art were examined.

It is important to note that in all the studies described below, participants were college students possessing minimal training and experience with art and photography. This is important, as numerous differences between naive and experienced viewers of art have been catalogued. As discussed later, examining naive viewers of art is only one part of the larger puzzle. Studies using trained visual artists and/or photographers are needed in the future.

**Automatic Processing of Artistic Photographs**

The first study we discuss explores the role of dual processing in aesthetic experience (Mullennix et al., 2013). The basic issue in this study was to identify the processing mode that viewers of visual art utilize when asked to view artwork and make judgments about it. There were some precedents to our study in the literature. As mentioned before, Hekkert et al. (2003) suggested that there exist two separate processing mechanisms for typical and atypical stimuli, respectively, that determine aesthetic preference. Their description of these mechanisms is similar in many respects to the notions of automatic and controlled cognitive processes we utilize. Axelsson (2007) conducted a study examining preferences for artistic photographs. He found that people with little experience in art or photography (termed “low-ability” viewers) preferred photographs that were familiar, static, and pleasant. But, photography professionals (termed “high-ability” viewers) preferred photographs that were uncertain, dynamic, unfamiliar and expressive. To us, since low-ability viewers liked photographs that were easy to process, this suggested that they used automatic processes when viewing the artwork. Since high-ability viewers liked photographs that were more demanding to process, this suggested that they used effort-intensive controlled processes when making their judgments.

Mullennix et al. (2013) used a concurrent task methodology to examine mode of processing. Participants were presented with artistic photographs and asked to make preference judgments for them. During the preference task, some participants also performed an attention-demanding task at the same time. The attention-demanding task was a standard digit preload memory task designed to impose a cognitive load on the participant (Baddeley, 1986; Baddeley & Hitch, 1974; Navon & Gopher, 1979). Participants were provided with 0 digits (control group), 3 digits, or 6 digits to remember prior to beginning the preference judgment task. They were told to make their judgments, but while doing so they also had to remember the digits because they would be tested on their memory accuracy for them. A concurrent load task such as this indexes whether automatic or controlled processes are being used for a task. Since automatic processes are capacity-free, a concurrent task that requires attentional resources should not affect performance on the judgment task if the judgment task is performed via automatic processes. However, if controlled processes are being used for the judgment task, it should be affected by the concurrent task, as competition for limited attention resources occurs.

In all the studies described here, the stimuli used in the experiments were artistic photographs printed on commercially available postcards (for some studies, the postcards were scanned, digitized, and printed out on photographic paper). Some photographs were from well-known photographers such as Ansel Adams, Helmut Newton, and Dorothea Lange. Others were from lesser-known visual artists who offered their photographic images for purchase online. An extensive pilot study was conducted to screen photographs and select a stimulus subset representing different scenarios ranging from concrete, everyday scenes to abstracts (see Mullennix et al., 2013, for details).

For this study, participants performed a preference scaling task (Axelsson, 2007). A 60-inch visual scale was set up on a table, running from 0 to 10 in equal intervals. Participants were given a stack of 32 black and white photographs and were asked to lay the photographs on the scale arranged according to their personal preference. The 0 value meant that they could not think of a photograph they had ever seen that they preferred less, while the 10 value meant they could not think of any photograph they had ever seen they would prefer more. They performed the concurrent memory load task at the same time. For the concurrent task, every five minutes the experimenter prompted them for recall and then gave them a new list of digits to remember until the next five minute period elapsed or the preference task was completed.

In a second part of the experiment, participants rated each photograph using 27 different semantic differential scales (adapted from Axelsson, 2007) to assess the characteristics of the photographs that affected their judgments.

Overall, the digit recall accuracy data did not vary across cognitive load conditions. In other words, six digits were just as easy to recall as three digits. This suggests that the simultaneous preference task did not compete for attentional resources required by the digit task, else digit recall would have been worse as the number of digits increased.

In addition, preference ratings for the photographs did not substantially differ across digit load conditions. This pattern of results meant that imposing a cognitive load via the digit task did not affect the judgment task. This result is consistent with the idea that a capacity-free automatic processing mode was used when viewing the photographs and making preference judgments about them.

Regression and principal components analyses of the semantic differential rating data revealed that the dimension of "Pleasantness," and to a lesser degree, the dimensions of “Clarity” and "Familiarity" determined preference ratings. Photographs that were pleasant, clear, and familiar were rated highest. This result is similar to what Axelsson (2007) found with naive viewers of photographs.

The most important aspect of this study was that the methodology allowed us to examine the cognitive/attentional
processes being used during the act of making preference judgments about art. Most other studies examining cognitive factors focus on preference data representing the output from cognitive/attentional processes. Thus, the idea that automatic cognitive processes are used by viewers of art during the formation of their impressions is bolstered here. However, we must acknowledge that the data is specific to fairly naive viewers of art who do not have extensive background or knowledge about art or photography. It may come as no surprise that these viewers would not devote much mental effort to processing artistic works, even when asked to judge them. From a practical point of view, this is useful information for people who create, market, and display art for the general public, in terms of designing spaces to view art.

**Cognitive Flexibility and Preference**

In the Mullennix et al. (2013) study, we observed much consistency in preference ratings across participants in their study. However, there was some individual variation. Unfortunately, the study was not designed to pinpoint the factors responsible for individual differences. One possibility for individual differences lies with differences between people in the ability to switch between automatic and controlled processing modes. A few viewers may have switched to controlled processing when viewing the artistic photographs, while most viewers were “stuck” in an automatic processing mode. To examine this possibility, and to further delineate the relationship of dual processing to preferences for visual art, we (Mullennix, Fallier & Mansueto, 2013) examined whether cognitive flexibility (i.e., the ability for people to effectively “mode switch” between automatic and controlled processes) affected preference judgments.

There is an extensive literature on cognitive control and its neurophysiological correlates. Cognitive control can be conceptualized as the ability to override automatic, reflexive processes when needed (Rougier et al., 2005, van Veen & Carter, 2006). In the area of creativity research, there is some evidence that flexibility of cognitive control and creativity are linked. Vartanian (2009) suggested that creative people working on solving problems may be adept at switching between defocused (automatic) and focused (controlled) attentional processes when working on different aspects of a problem. Zabela and Robinson (2010) concurred, suggesting that creative individuals are capable of rapidly switching between defocused and focused attention processes when the processing context demands it.

Zabela and Robinson (2010) conducted an empirical study to examine specifically whether a relationship exists between flexible cognitive control and creativity. They developed a measure of cognitive flexibility based on trial to trial performance in a Stroop color naming task. An analysis of color-congruent and color-incongruent trials allowed them to index the participant’s ability to mentally prepare for a color naming response, with more efficient naming responses correlated with a greater degree of cognitive flexibility. Creativity was indexed through scores on two standardized measures of creative originality and creative achievement. They found that creative individuals possessed higher levels of cognitive flexibility and were able to better modulate their cognitive control processes from trial to trial when performing the color naming task. Given these findings, it would appear reasonable to assume that creative artists possess a high degree of cognitive flexibility. It's possible that creative artists are able to employ mode switching better than the average person and that this assists them in the creative process involved in creating works of art.

Although cognitive flexibility appears to be a factor in creation of art, is it a factor in aesthetic appreciation? In the present study, we assessed preferences for visual art while indexing the degree of cognitive flexibility possessed by each participant. Our idea was that if cognitive flexibility plays a role in viewing art, with the viewer able to more easily engage cognitive control (e.g., effortful processes), those engaging that control will process artistic photographs differently. Axelsson (2007) showed that this may occur with trained photographers, albeit he explained this via a different processing framework than we use. Our expectation was that viewers with more flexibility would prefer abstract and complex photographs more than viewers with less flexibility. In addition, we expected that semantic differential ratings for the photographs would differ based on differences across participants in flexibility.

Participants were shown the same artistic photographs used by Mullennix et al. (2013). The preference task was identical to our previous study. The semantic differential rating task on computer consisted of five scales (interest, complexity, concreteness, familiarity, pleasantness). A Stroop color naming task similar to that used by Zabela and Robinson (2010) was used to index cognitive flexibility.

Overall, the preference ratings mirrored the findings of Mullennix et al. (2013), with photographs that were rated as pleasant, familiar, simple and interesting preferred more. Although there was substantial variation in degree of cognitive flexibility across participants (as indexed through the Stroop task), there was little to no correlation of degree of flexibility with the preference ratings or the semantic differential ratings of the photographs. Hence, we obtained little evidence that cognitive control and flexibility played a role in how these viewers processed the photographs.

**Cognitive Effort and Preference**

In considering the findings of Mullennix, Fallier, and Mansueto (2013), one possibility concerning cognitive flexibility and aesthetic experience is that cognitive flexibility may be necessary but not sufficient to produce a different aesthetic experience in the viewer. In the two studies described so far, minimal instructions were provided to participants for the preference task. They were told only to arrange the photographs on the scale in terms of their personal preference. Instructions were administered in this way in an attempt to preserve some aspects of a real life situation where viewers encounter artworks without any guidance and make judgments about them.
Other studies suggest that when instructions are manipulated to emphasize aesthetic processing, cognitive control processes are engaged. In a study by Cupchik et al. (2009), they manipulated the type of instructions given to viewers (who had no formal training in art) to use while viewing paintings. One set of instructions emphasized aesthetic processing (i.e., viewers were told to approach the paintings in a subjective and engaged manner, focusing on mood, feelings, etc.). Under this instructional set, brain imaging revealed that brain areas related to top-down cognitive control were activated. They concluded that aesthetic experience was partially determined by the top-down orienting of attention.

Although the evidence obtained in our research suggests that viewers use an automatic processing mode while viewing art and making preference judgments, we decided to create a situation to see whether viewers could be induced to switch to controlled processing. In a recent experiment from our laboratory, we attempted to increase cognitive effort during the preference task via two manipulations. The first manipulation was instructional. We adapted Cupchik et al.’s (2009) pragmatic and aesthetic instructional sets for use. The pragmatic instructions were fairly neutral. In the pragmatic condition, participants were told to approach the preference task in an objective and detached manner and to not spend too much time thinking about the meaning of the photographs. In the aesthetic condition, they were instructed to take time in deliberating over the photographs, to think about the artistic meaning, and to focus on the mood and feelings that the artwork elicited in them. The aesthetic-based instructions were designed to engage the viewer’s cognitive control processes (Cupchik et al., 2009).

The second manipulation was facial expression. While participants performed the preference task, some were asked to contract their corrugator forehead muscle (i.e., furrow their brow). Contraction of the corrugator muscle has been shown to accompany the expenditure of mental effort (Cacioppo, Petty, & Morris, 1985; Larsen, Kasimatis, & Frey, 1992; Stepper & Strack, 1993). It is believed that feedback from the corrugator muscle may induce a person to exert more mental effort while performing a task. In the neutral conditions, participants were given no instructions pertaining to facial expression.

The preference task was similar to previous studies. In this experiment, a set of 32 color photographs was used. Color was selected instead of black and white to add an extra dimension that participants in the aesthetic instructional conditions could attend to. Participants in the furrowed brow conditions were asked to fill out a two-question post-test asking them to rate the difficulty and strenuousness of sustaining the furrowed brow during the task. Participants also rated each photograph on the semantic differential scale used by Mullennix, Fallier and Manseuto (2013).

The preference results are shown in Figure 1. Overall, preference ratings for the photographs were higher for aesthetic instructions compared to pragmatic instructions. Ratings were also higher when the brow was furrowed compared to conditions where no facial expression instructions were provided. There is some indication that the two manipulations interacted, with ratings highest under conditions where viewers furrowed their brows while receiving aesthetic instructions. The post-test for furrowed brow participants showed that they were able to sustain the facial expression and do so with a moderate degree of difficulty.

On the surface, the results indicated that photographs were preferred more when cognitive effort was greater, with both instructions and contracting the corrugator muscle contributing to the effect. This suggests that controlled processing can be induced under these conditions and can affect preference judgments. However, the effects were weak. Effect sizes were small and the magnitude of differences between conditions was small ($M = 4.72$ for the pragmatic/neutral condition versus $M = 5.10$ for the aesthetic/furrowed condition), considering that we used a 0.0–10.0 preference rating scale.

![Figure 1: Preference rating data across conditions.](image)

So what should we conclude from this study? One could focus on the small effects and dismiss them as fairly meaningless from a practical standpoint. However, we favor a different perspective. We showed that in one short experimental session using participants with little art or photography experience, we were able to shift their preferences slightly, through simple instructions and a simple facial muscle contraction. In some sense, it is remarkable to see this shift occur at all, given the brevity of the experimental session. We were also able to demonstrate that Cupchik et al.’s (2009) findings on aesthetic instructions were able to translate over from brain imaging data to an overt behavioral measure related to preference judgment. With further training, we may have seen larger effects exhibited. Overall, it’s reasonable to assume that participants expended more cognitive effort under certain conditions. It’s interesting to note that the effect of increased cognitive effort was to increase the rated preference for the majority of the photographs. In other words, if you focused your attention more on the artistic photographs, you liked them better.
Conclusion

Overall, these studies show that naïve viewers of visual art use an automatic cognitive processing mode when making preference judgments about artistic photographs. Cognitive flexibility does not appear to be a major factor in determining the processing mode adopted by the casual viewer of visual art. However, under certain conditions, it appears that a controlled processing mode can be induced. One important caveat about these studies is the training and experience of the viewers. As mentioned previously, participants across all three studies possessed little training and experience in art. There is extensive research showing that experience, training, and expertise in art affects aesthetic experience (Axelsson, 2007; Cupchik & Gebotys, 1990; Eyesenck & Castle, 1970; Hekkert & van Wieringen, 1996; Leder et al., 2012; Schmidt, McLaughlin, & Leighton, 1989; Silvia, 2013; Winston & Cupchik, 1992). Would we obtain similar findings with trained visual artists or those familiar with art history or photography? That is an important question. Based on our theoretical dual processing perspective, we can derive different predictions. If experience dictates the processing mode used, we would expect experienced artists to use controlled processing while making judgments about art. If artists are more creative, and possess greater cognitive flexibility, they should be able to switch processing modes more quickly and efficiently while viewing art, depending on the specific task they are given. As well, artists may be different than naïve viewers of art in their resistance to manipulations designed to “push” them to using controlled processing. At any rate, further studies examining trained visual artists are needed to assess whether the present findings generalize only to naïve viewers of art or whether they generalize to individuals with expertise in art or photography as well.

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References


Relationship Between Music and Painting: Replication of Emotional Response

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Abstract

The purpose of this paper is to determine how the degree of emotional response one experiences in music might be replicated in a painting. The goal is to identify critical factors that generate an emotional response in a painting. The process of recognition of an art form is defined and results of experiments by neuroscientists are outlined. The personality profiles of artists and the general viewing public are identified and common elements are highlighted. The author assessed the emotional response of forty-two individuals to two of his paintings. The results show that the emotional response was high and dependent on many factors. Subject matter was critical and effective use of light can have as much of an impact as color.

Introduction

The relationship between music and the visual arts has been studied and widely practiced by several artists. A summary of these relationships is presented in Wood (2011). Examples from this summary are highlighted here. The Russian Modest Mussorgsky wrote a piano series of ten movements, Pictures of an Exhibition, depicting each of Victor Hartman’s paintings and drawings. This piece was reproduced by other composers including the French composer Maurice Ravel. Another example is the relationship between Monet’s Impressionist paintings and Debussy’s music. In particular, Monet’s Impression: Sunrise which focuses upon loose brushstrokes and the fleeting effects of color and light. As a comparison, one can cite Debussy’s Impressionist music in Nuages where he provides each instrument one type of lyrical line to play. In this case the emphasis is on the quality of sound and lack of cadence rather than the compositions melody. Another example is that of Edward Munch and Arnold Schoenberg in Norway. Munch’s Scream demonstrates the Expressionist style of painting by depicting the darker side of human emotions. In comparison, Schoenberg’s Five Orchestral Pieces demonstrate the jarring dissonances between the various units of the music.

It is well known that paintings and music evoke varying types of emotions. This area has been thoroughly researched since the seventeenth century. Freedberg (1989) reached conclusions regarding the immediate perception of an image and the emotional responses to it. In a recent interview, Freedberg (2012) cited the discovery by neuroscientists in Italy that the firings of neurons in the brain of a monkey watching another monkey performing some specific task have similar characteristics. It was also observed in other experiments on selected humans with epilepsy that there were similar firings of neurons of individuals watching others performing various tasks. It is possible that these experiments demonstrate the empathy between people but it can also suggest that observers may share the same sensations as those images in a painting showing motion. The Art & Neuroscience Project of the Italian Academy for Advanced Studies in America at Columbia University has been established to encourage, in part, investigation of responses to works of art – visual, literary, and musical. New developments in the cognitive neurosciences have greatly illuminated the neural function of such responses. It is cited that the observation of specific categories of visual stimuli induces the activation of the observer’s cortical motor system. In particular, it has been shown by Umiltà (2012), both in monkeys and humans, the observation of motor acts and gestures activate their motor representations in the observers’ brain. The perception of visual artworks begins with the visual analysis of the stimulus, which then undergoes further processing. There is an “aesthetic experience” likely based on biological mechanisms that are influenced by factors such as the context, individuals ‘interest in the artwork, prior knowledge, and familiarity. Freedberg (2006) provided examples from the history of painting and music of efforts to connect particular compositions with specific emotional states. He cited an analysis of the modes of music compositions and the types of emotions that are generated.

There are several types of migrations of technique or subject matter from one type of art to another. This was studied in detail by Cristia (2012). This author maintains that the migration from one medium to the other, from one art to the other seems to occur on five levels: emotional, material, morphological, textural, and conceptual. In this paper the focus will be on the emotional response from one art form to another. In particular, when one listens to a moving musical melody, there is some emotional response to the music. It might be in the form of happiness, sadness, anxiety or deep satisfaction. In some cases, there is an emotional high that is achieved; quiet similar to the response when one has completed a significant task. This high status lasts from a few seconds to minutes. However, when viewing a painting, a much more subdued high or satisfaction is achieved. It can be a response to its beauty; it’s almost photograhic realism, an abstract composition that demonstrates unity of design, a scene that recalls pleasant or sad past experiences, or a connection that generates some degree of enthusiasm. The fact that painting is a static medium as opposed to the dynamic nature of music impacts on their respective degrees of response. The question then becomes, is it possible to replicate the high degree of emotional response from a musical melody to that of a painting? If the replication can be made, then the impact of the painting will be significantly
enhanced. The goal is to identify the critical factors in a painting that generate an emotional response similar to that of music. Clearly, the response to music or paintings is very dependent on the listener’s or viewer’s personality, past experience, environment, and many other factors.

Process

I will now examine the process of recognition of an art form and determine whether it is feasible to replicate the emotional high generated by music to that of painting. A basic sketch of the process of recognition is as follows:

1. Art form
2. Cognitive processes
3. Emotional response
4. Memory

In this case, an art form such as a musical melody is considered by the cognitive process of the brain, and a certain emotional response is achieved, which can be modified or enhanced through our memory and reapplied through the cognitive process. This feedback loop will lead to the ultimate response to the musical piece. This same process can be applied to another art form such as a painting.

It is interesting to note that there is a five-year major initiative, called Human Connectome Project, which is examining the connections between brain regions. The researchers employ three imaging methods. The magnetic resonance imaging (MRI) scans provide basic structural images of the brain. Then a series of functional MRI (fMRI) scans which detect blood flows throughout the brain, show brain activity for subjects both at rest and engaged in different tasks such as language, memory, etc. Then there are scans using a technique called diffusion MRI, which tracks the movement of water molecules within brain fibers. This allows researchers to trace the neural connections between sections of the brain. A new project, called the BRAIN Initiative, will zoom in on the connectivity of small clusters of neurons.

The cognitive process for generating an emotional response has been examined by neuroscientists. More specifically, functional MRI tests were conducted by Vessel (2013) to determine specific responses to paintings when individuals were placed in the fMRI machine. It turns out that medial prefrontal cortex becomes engaged when viewing paintings. This brain region has been implicated in planning complex cognitive behavior, personality expression, decision making, and moderating social behavior. The basic activity of this brain region is considered to be orchestration of thoughts and actions in accordance with internal goals. This is the region of the brain that shows sensitivity to art. There are actually two regions: back of the brain and front part of the brain. More specifically, Vessel (2012) showed that the region in the back of the brain reacts linearly to sensations from paintings. In particular, readings were provided by the viewer that corresponds to a 4 point system (1: least moving to 4: most moving). While the region in the frontal part of the brain reacts only when there is truly a moving piece of artwork; otherwise it is generally suppressed. Neuroscientist also discovered that there is a motor response through the motor cortex, which becomes active when listening to music. It also appears that there is a motor evoked potential response when viewing a painting that depicts motion, gestures, or an emotional scene such as sorrow. It appears that this part of the brain becomes activated in the same manner as if one is experiencing the emotion seen in the painting. In fact, a photograph does not generate the same level of evoked potential as a masterpiece painting. A recent study by Umilta (2012) investigated whether the observation of high-resolution digitized static images of abstract paintings by Lucio Fontana is associated with specific cortical motor activation in the beholder’s brain. In fact, this activation is present even when there are no explicit representation of movement, and independent of visual familiarity of the paintings.

As discussed earlier, the emotional response to paintings and music are generally different. Paintings are sometimes considered to be static art forms and not dynamic as that of a musical piece. Is it possible to capture the emotional response from the musical piece and replicate it to the painting? Many artists might think this to be impossible, and at best, highly dependent on the individual. Let us explore this process further. The emotional response to a particular painting can be highly dependent on how well the artist employs line, shape, color, texture, and contrast to create an illusion of a three-dimensional window into space on a two-dimensional canvas. In addition, the subject matter may play an important role in the emotional response. For example, a peaceful landscape or seascape scene may evoke an emotional response of serenity and calmness; turbulence and storms can create a disquieting response.

Is it possible to enhance the viewer’s response by creating an illusion of another dimension in the painting and conferring upon this static medium a greater dynamism? The illusion of a fourth dimension of motion can be achieved through the addition of paint strokes and color variations. The Italian Futurists were interested in the depiction of movement and emphasized the beauty of speed. (See Marinetti’s Futurist Manifesto, 1909 “the splendor of the world has been enriched by a new beauty; the beauty of speed. See images by the painters Marinetti, Balla, and the sculptor Boccioni). These artists sought to express in their works the dynamism that exists in society because of new technologies. The addition of multiple images to a painting of
a ballerina may fool the eye by suggesting that she moves from one pose to another. Likewise the addition of multiple images to a painting of a cyclist may provide a sense of racing movement.

Creating such dynamism has an impact on the viewer’s emotion. But emotion can be impacted through portraiture as well. Facial expression and gesture create a mood by the reaction of the sitter. This mood can be transferred to the viewer. It could be a sign of happiness or sadness; the range of possible emotions is wide and might include those never considered by the artist. The viewer’s emotional response could be similar to that achieved from a musical piece. Additions to the painting might heighten and refine the nature of the desired emotional response; changes to the background, for example. The ultimate goal is to replicate the high level emotional response experienced in a dynamic musical piece to the more static painting and thus to increase the emotional impact of the painting. Some might argue that is impossible to replicate responses from one sense (hearing) to another (sight) or vice versa. Consider the case of watching a silent movie without subtitles. It is easy to achieve some emotional response from the actions and facial expressions of the characters by using our cognitive and memory processes. This can be as significant as that achieved from selected musical melodies.

### Personality Profiles of Viewers

The emotional response to an art form is dependent on many factors including background and experience of the viewers, personality profiles, mood, and environment. In this section of the paper, I will examine the impact of personality profiles of artists and art collectors. The Myers-Briggs Personality Indicator (BMPI) is one such measure. Basically, BMPI provides the identification of basic preferences to four main areas leading to 16 distinctive personality types that result from the interactions among the preferences. The preferences are as follows: 1. Favorite world: preference to focus on the outer world or on own inner world. This is called Extraversion (E) or Introversion (I); 2. Information: preference to focus on the basic information one takes in or preference to interpret and add meaning. This is called Sensing (S) or Intuition (N); 3. Decisions: when making decisions, preferences to first look at logic and consistency or first look at the people and special circumstances. This is called Thinking (T) or Feeling (F); and 4. Structure: in dealing with the outside world, preference to get things decided or preference to stay open to new information and options. This is called Judging (J) or Perceiving (P). There are 16 personality types with various combinations of characteristics or letters. It is interesting to note that an artist is an ISFP type (introverted, sensing, feeling, perceiving). A music composer also has the same type of personality. ISFPs have finely tuned artistic sensibilities. They are in tune with the way things look, taste, sound, feel and smell. They have a strong aesthetic appreciation for art, and are likely to be artists in some form. They are unusually gifted at creating and composing things which will strongly affect the senses. They have a true appreciation for the beauties of nature. Famous artists with ISFP types include Mozart, Picasso, and Rodin.

There is a study by Gridley (2004) of 27 art collectors (13 men, 14 women) who completed the Myers-Briggs Type Indicator. Their age range was 37 to 86 years and the mean 59.5 yr. Seventy percent of the collectors were classified to have personality profiles similar to those of artists. This finding supports the contention that persons creating art and appreciating art have personality traits in common. The personality profiles of viewers vary widely and it is difficult to create paintings that evoke emotional response from all viewers. However, an examination of the majority of the U.S. population by personality types by the Center for Applications of Psychological Type reveals that ISTJ (11%-14%), ESTJ (8%-12%), ESFJ (9%-13%), and ISFJ (9%-14%) are in the majority. The common theme appears to be Sensing (S) with a preference to focus on the basic information that one takes in through the five senses versus interpreting and adding meaning. This implies that the artists may want to focus on a sensing population for maximum return on their investment.

### Analysis

It has been noted that the emotional and evaluative reactions to a painting depend on a complex dynamic interaction among characteristics of the painting, the viewer, and the physical, social and historical contexts of the experience. An overview of the research techniques to understand the elements of composition in paintings was recently provided by Locher (2012). In addition, factors that have been shown to influence a viewer’s perception include a painting’s title, its format, and frame.

I followed a two-step process in analyzing the emotional response. The first step was to convince myself that the emotional response can be replicated. I conducted an experiment by listening to lonely and melancholy music by Barber: Adagio for Strings which is composed in B-Minor. My emotional response was very moving and gut-wrenching. Then I viewed a painting by Olere (1989) called Gassing. The emotional response to this painting and others representing the Holocaust were even stronger than the music piece. This means that for certain subject matters, the emotional response to a painting can be just as dramatic or even more than that for music. The second step was to conduct a survey of emotional response to two of my paintings using a total of forty-two individuals ranging in age from ten to eighty-six year old. The reason for the choice of my paintings was that they are original and have not been viewed previously by the population. This hopefully limits the potential bias by viewers to well-known art. Furthermore, the subject matters were chosen carefully to generate opposite emotions. A scoring system was used to
identify the level of response. There were six fellow artists from an international art website who provided feedback on their emotional response. The request was made to identify the factors that can create an emotional response, but not necessarily replicating exactly the response to music. For the survey, I painted a scene from a bullfight as shown Figure 1.

![Figure 1. Bullfight](image)

I mentioned that I liked to paint landscapes and seascapes because of the serene nature of the scenes. This time I decided to expand my horizons and select a controversial subject of a bullfight. I requested the individuals to identify the factors that create an emotional response to this painting with particular emphasis on use of color, sense of motion, facial expression or lack thereof, gesture, composition, subject matter, brush stroke, etc. The initial feedback was more focused on the horrific act of a bullfight than the emotional response. After clarifying the intent of the exercise, there were more specific responses such as the use of colors to create a mood in the picture, such as muted tones, greys and cold colors on the matador while using warm colors on the bull to generate a feeling of his life. Furthermore some of the artists suggested that the bull has been painted in a far stronger way than the matador with less detail, thus providing stronger color and more directness. This directness expresses and even exaggerates the bull’s strength and character which evoked an emotional response. These comments focus on the use of color to generate emotion on the life, strength and character of the bull. Another artist suggested the use of light to both subjects through an established light direction to allow one to create more highlight and shadow. This could help describe the form in a more three dimensional way. It was noted by Humphrey (2012) that the color can evoke certain emotions. Red can express anger, or love, or embarrassment. Black can express fear, while orange and yellow can express pride and happiness respectively. The matador painting certainly has these colors with the matador evoking mixed emotions of anger, love or embarrassment, while the black color of the bull depicting fear, and the orange color of the matador clothing evoking pride and happiness.

The other twenty-five individuals consisting of family and friends who do have an appreciation of both music and paintings, were asked to provide their emotional response to the painting as compared to their response to their favorite music. They responded in a similar fashion; the eyes of the bull showed surprise and innocence, while the matador by turning his face away demonstrates indifference and possibly cockiness. The emotional reaction was an expression of anger with the matador. There was empathy for the flight of the bull, loss of power, dignity and sorrow. Some focused on the expressions of the bull and matador, highlighting the fright of the bull and the lack of expression of the matador. Some cited no emotional response but commented on the beautiful art and pleasing use of primary colors. They also mentioned that the red color of the cape is traumatic and the spears convey the emotion of pain. Others pointed out that this painting evokes happiness for them and for certain cultures since it is a national sport. This suggests that culture plays a key role in the emotional response. A scoring system of 1 to 4 was then applied to the responses, with 1 used for no emotional response, and 4 for maximum response. The scoring results show that 40% for maximum emotional response, 51% high response, 2% low response, and 7% no response. This implies that a significant majority experienced a high level of response. I also provided another one of my paintings in monochrome, with a non-controversial subject matter, of a scenic trail in the woodland as shown in Figure 2.

![Figure 2: Scenic Trail](image)

The responses from another eleven artists from the international art website ranged from who needs color to express the feeling of this painting to much easier on the eye leaving one to imagine the colors. Others suggested that the painting looks dramatic, and makes one look and go slowly on the trail. This clearly demonstrates that other factors such as the effective use of light can have as much of an impact on the emotional response as color.
Conclusions

Now that we have concluded from the survey and my own experiment that the degree of emotional response can be similar, the question then is how to replicate the degree of emotional response from music to painting. From the Gassing painting, it is evident that subject matter, composition, facial expressions, gestures, sense of motion, contrast, lighting all play a key role in the response. From the survey of artists, art collectors, and other individuals, the subject matter, color, and composition were important factors for an emotional response. In my case, the subject matter was the most significant factor that generated an equivalent emotional response to the musical piece.

In order to scientifically determine the level of response, it is necessary to conduct an experiment using individuals in an fMRI machine that measures the actual response for both a piece of music and several paintings. Based on the response, one can then determine which painting comes close to the emotional response from the music piece. The features of that painting will have to be examined to determine the factors that are the most significant in achieving the equivalent response.

It is clear that the emotional response is dependent on many elements including the background and experience of the viewer, personality profile, emotional and psychological state of mind, and environmental factors. The subject matter is a significant factor in generating an equivalent response in paintings to that of music. Furthermore, the effective use of light can have as much of an impact on the emotional response as color. Although other factors were identified in the paper, more scientifically proven ways by neuroscientists are required.

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Cultural Aesthetics in the Omabe Masquerade Tradition:
An Exploration Of A Culture In Transition

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Abstract
The Omabe masquerade festival is among the numerous masking traditions of the Igbo people of southeastern Nigeria still performed till date. Ecstatic colors, unrivaled energy and cultural aesthetics herald the appearance of every Omabe masquerade. Today, like many African indigenous traditions and cultural activities, it is threatened by transmogrifications detrimental to the preservation of its rich cultural heritage. The paper is intended to investigate if this gradually fading masquerade tradition and cultural heritage still provides any level of enthusiasm and aesthetic satisfaction, or plays any significant role within the contemporary Igbo society. It also identifies ways through which the Omabe masquerade tradition can be developed into a global cultural attraction and incorporated into tourism development program of the Igbo ethnicity.

Keywords: Nsukka Omabe; Igbo Masquerade

Introduction
Masks and Masquerade celebrations are some of West Africa's most enduring art forms and cultural practices that have been part of the integral life of the people long before colonialism. West African people have been able to preserve their cultural heritage through diverse creative means, which many scholars misinterpret as mere crafts passed down through subsequent traditions. However, to them, these means, which include art, ceremonies, initiations, celebrations and spiritual events, are vehicles through which their cultural traditions are preserved. In a way this has conveniently acted as an appropriate alternative for the lack of written history within the African cultures themselves.

As mentioned earlier, the African artist perceives his art in a much different way from the western artist. To him his art is deeply rooted in his beliefs in the supernatural, which dictates his aesthetic preferences. Thus, when he carves a mask, it is usually sculpted with the sole aim of emphasizing this. This is clearly evident in the fact that the facial characteristics of these masks reveal an impressive range of varieties. Some of them can be easily identified by features such as negroid naturalism, idealized human portrayal, frightening expressions, abstractism (semi-abstract or highly abstract), animal-human hybrids and superstructures. Among these, masks that are naturalistic in nature are the rarest, since aesthetic as early stated is not the objective; the masks are intended to house or embody the spirits. In other words, the approach or the expression the artist depicts on the face of the masks is meant to depict the nature of the spirit it is meant for. Therefore, a mask with intimidating facial features represents a malevolent spirit, while masks that seem playful are meant for spirits with that nature. This perspective is supported in this statement by Harden (2011):

The masquerade’s elaborately created physical presence evokes a great range of feelings, from approbation and appreciation to fear and awe. Sometimes these performances are part of serious religious ceremonies: Masqueraders can represent spirits who may possess the dancers, giving them special knowledge which they express in their performance.

Masquerades in African cultures play very significant roles in the society, which will be further discussed in the paper as it relates to the Omabe masquerade. The masquerades are used in not just festivities, there are sometimes used in initiation rites whereby an adolescent is assisted through to them in that rite of passage into responsible adulthood. In other instances, they act as a bridge between the living and the dead, preserve food supplies and project the connection between the environment and the community. Everything about the masquerade is significant, from the masks, to the entire costume to the theatricality of the individual performing it and the music accompanying or dictating the performance. It is a common belief by most African that the dancer becomes the spirit he is depicting, which is needed to aid in meeting the particular need of the society. In that defining moment, everything is connected in a mystical symbiotic relationship; the environment, and the spirit of their ancestors.

The Omabe Masquerade festival:
An Overview
Omabe is a masquerade feast which features the initiation of youths into the secrets of the mask dancer in the Ibagwa Aka. It is also involves a drama performance of of Nsukka communities in South eastern Nigeria, as a re-enactment of the spirits of deceased ancestors. Esogbue (2011) describes the festival in his article on the Short History of Obollo towns and Communities in Enugu wherein he states:

There is Omabe feast in which a masquerade of heroic deeds comes out but only once in four years do the anxious anxious people to catch a glimpse of it. This is why “Omabe” is believed to be the name of valiant
masquerader with great achievements. The feast may therefore symbolize heroism and braveness of some sort in the life of the community. (Esogbue, 2011)

The Omabe places much emphasis on the distinct nature of three maximal lineages into which the community is grouped. The feast is used to rotate among these three maximal lineages and allowed a period of three years between celebrations. Since the festival lasts for a whole year, it would take about twelve years to fully complete a cycle.

The Visual Aesthetics of a Unique Socio-cultural Heritage: A Review

Omabe is specifically celebrated every year by the different Nsukka communities of Igbo traditional society in honor of their ancestors and deities. Ecstasy in colors, great energy and cultural aesthetics heralds the appearance of each Omabe masquerade. Omabe masquerade performances provide high level of physical, psychological, and spiritual satisfaction to members of these communities.

There are two masquerades that are identified in Nsukka during the Omabe festivals, and they include the Oriokpa Omabe and Echaricha Omabe.

The Oriokpa, which is the costumed variety of the Omabe is usually clad in simple ragged apparels that are predominantly white as depicted in fig.1. It is similar to the Ekewo (Fig.2), which is another variety of Oriokpa that operates in communities that perform the Odo instead of the Omabe festival. This masquerade represents the spirits of the less illustrious ancestors of the community like drunkards, loafers, weaklings among others (Chase, 2010). They also perform functional roles in the society by acting like a sort of traditional cops or police with the sole responsibility of not only protecting the Echaricha Omabe but equally maintaining law and order within the community. Hence, they are often seen holding whips or cane with which they inflict corporal punishments on mischievous children. At other times they chide troublesome women by mimicking them in satirical songs (Ibid, 2010). As portrayed in figure 1, the costume’s uniqueness is evident in the way it visually portrays this role metaphorically. The innuendo implied in the masquerades’ loose ragged apparel is intriguing; it not only reflects the average drunkard’s nonchalant attitude and manner of dressing, the stealthy psychological impression it evokes also alludes to the sneaky mannerisms of a detective or a cop on patrol. The white color of the textile, which suggests innocence or purity (or advocacy for purity) is a succinct symbol of the masquerade’s authority and qualification to mete out any form of punishment he deems fit for the culprit. On a closer introspection, one notices that the red area around the mask where the eyes are is painted red. Red symbolizes danger or a warning that is a warning to any potential delinquent that their actions have consequences which this masquerade is obliged to carry out.

The Echaricha Omabe, on the other hand, depicts the spirit of the illustrious or affluent ancestors of the community. These include the famous warriors, distinguished farmers, valiant hunters.

This explains why, in comparison to the Oriokpa, the apparels are more flamboyant, stylish and elaborate, a symbolic expression of its strength with allusions to notable ferocious wild cats (For instance the facial mask is a symbol of the striped face of the tiger, the body a cheetah’s spotted fur and the arm bands that of a lions mane. These feline symbolism represent the responsibility of the omabe to protect the community, particularly its devotees who pay homage and regularly offer food sacrifices to it (see fig. 4), from dangers and unforeseen calamities (ibid, 2010).

The Echaricha Omabe


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The Omobe festival as a Tourist Attraction: Challenges and Prospects

Over the years, many of the festivals that are being recognized in Nsukka are slowly fading away. The Nsukka community in the time past celebrated a number of these festivals. In the past, quite a number of these festivals were celebrated by the indigenes of Nsuka. Some of them include the Onwa Eto, or Onwa Ito (the 3rd moon) Festival, the Onwa Ise (the 5th moon Festival); Onwa Esa’a (the 7th moon Festival); the Onunu Festival and the Omabe festival. The Onwa Eto, also known as the festival of the third moon, is normally acknowledged with rites that include slaughtering several fowls in each household for each child residing there and in the memory of deceased family members. The fifth moon festival or the new Yam festival, known as Onwa Ise, marks the beginning of the yam harvest. During the Onunu festival, indigenes recognize this period by going to the Nkwo market Arena, where dances like ‘Oromme’ Dance, traditional wrestling and so on are performed. The Onwa Esa’a was also noted as the period for the eating of dried cocoyam (also known as Echicha). In all these festivals, the Omabe still remains as the only surviving one (Najasjky, n.d). This reality calls for concern and immediate response as to the causes and possible strategies to be undertaken in resolving them. One of such is the issue of tourism.

Tourism as an industry, is not only regarded as a vehicle for promoting cultural exchange that enhance international understanding and goodwill among the diverse peoples of the world, it is also a catalyst for enhancing many country destination employment opportunities, foreign exchange and infrastructural facilities (ESCAP, 2002). Krippendorf provides a useful framework for evaluating the phenomenon of tourism. He believed that it could be perceived as the resultant of four forces that are acting simultaneously and connected by a complex network of interactions (Krippendorf 1987:3-5). In 1991, the Federal Government of Nigeria evolved a tourism policy. This was intended to develop and promote tourism in an economically viable industry within the country (Galleria Media Limited, 2006). One of the major highlights of the policy is to ensure that Nigeria stands out as a leading tourism destination in Africa. Other objectives of the policy include; encouragement of even development, promotion of tourism-based rural enterprises, employment opportunities, acceleration of rural-urban integration and fostering socio-cultural unity amongst the regions of the country through the promotion of domestic and international tourism (ibid, 2006).

The Nigerian government and the indigenes of Nsukka will benefit tremendously from tourism, if the tourism potential that the Omabe Masquerade Festival is harnessed and strategically explored. This is also, to an extent, largely dependent on the fact that the festival itself promises the availability of cultural, historical and natural resources for enjoyment. From the socio-cultural perspective, the aesthetic disposition of the Omabe Masquerade Festival as discussed in this paper is unique and inexhaustible, and a tourism prospect worth investing in for any country.

Conclusion

The masquerade is one of the timeless theatrical art forms performed by many communities in Africa. Over the years it has amassed a growing audience profile and tourist attractions. In addition, its uniqueness is further characterized by factors such as durability and continuity by family and communal inheritance of the art, craft and magic and culture associated with it through generations. In Nigeria, the Igbo ethnicity, like the diverse ones existing in the nation, has a very unique world view as regard masquerade festivals. They are usually identified with the spirits of the ancestors, and also depend on the nature of the ceremonies associated with it.

The Omabe masquerade festival, like many other festivals, has rich tourism potential which has not been explored, and is capable of attracting international tourists. Added to that, the rites and colourful festivities associated with it have the ability to enthral visitors who are witness the events. Despite the fact that issues such as rural urban migration, inclination of indigenes towards western influences and challenges in properly transmitting the beauty of this rich cultural heritage, the festival is threatened with the danger of extinction like the other ones that existed alongside it within the community. Therefore, this paper recommends that strategic steps be taken to ensure its sustainability for posterity. Tourism is one of such steps. Another approach is encouraging research that is aimed at projecting, properly analysing and recording the events as they come for scholars and art historians. The government--that is at the Local, State and Federal levels--could also provide creative incentives that would attract tourists to these festivals.

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Content and Context of African Indigenous Textile Production: A Study in Visual Aesthetics

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Abstract

Indigenous African textiles are usually enriched with very fascinating patterns and color aesthetics and often riddled with conceptualism in their diverse themes and designs. However, the study of these indigenous textile forms, ideas and materials, except for very few related scholarly works, appears to have been relegated to the background. This paper focuses on the aesthetic inclinations of indigenous African textiles in terms of their symbolic forms and rhythms, examining the place of their production in regards to the psychological satisfactions and the creative sensibilities of the individuals and ethnic communities that produce them. Finally, it reveals the extent and purpose to which these indigenous textile motifs, design patterns, and other artistic ideas is transformed into new artistic metaphor.

Keywords: Indigenous art; African textiles

Introduction

Indigenous African textiles can be found everywhere within the different regions of the continent and are easily available too. They are manufactured and traded on a very large scale for different social, cultural, religious and economic reasons. These locally produced African fabrics include substantial number of batiks, printed materials and woven structures made from hand or machine spun-cotton and other fiber materials. Extensive studies have been carried out by African and international scholars in the different areas of her arts and cultures, especially in the study and documentation of cultural festivals and sculptural pieces made from wood and other indigenous materials. Many of these traditional textiles have been identified by some art scholars as possessing the fundamental features of modern art; their inherent symbolic motifs, forms and rhythmic patterns have provocative conceptual dynamics that transcend their presumed mere functional and aesthetic role as crafts rather than art works. No art form, including these traditional textiles, is created from a vacuum, thus, the question on why they are evaluated as regards their importance or quality and are often judged, based on the creative skills of the artist that produced them without understanding the different creative elements that inform or influence his or her creative instincts.

The aesthetics and regal splendor that defined these fabrics creation are profound, creative and quite revealing. The evidences are diverse and enthralling across the many cultures existing within the continent; from the “Kente fabric woven in strips in silk for the Asante Empire and its’ Royal Court; skirts woven from raffia wrapped around Kuba King’s resplendent menservants and indigo blue tunics that are embroidered with elaborate design and intricate pattern by the Fulani tribe who live in the Niger delta and add a dignitary air to the wearer.” (Evans, 2010). Some of the notable indegenous textile designs include: Adire, which is an indigo cloth, and Aso-Oke, woven strip cloth both from the Yoruba’s of southwestern Nigeria, the Adinkra, a stamp printed cloth from the Asante and the Kente, woven appliqued cloth from the Asante both from Ghana; the Asafo, appliqued flags from the Fante of Ghana; Dida, raffia cloth from the Dida, and Fila, dye-painted cloth from the Senufo of the Ivory Coast; the Bogolan, mud cloth (Bamana or Mande) and Kaasa, woollen blanket from the Fulani of Mali. Others include the bark cloth, painted from the Buganda of Uganda, the Kuba, showa cloth from the Kuba of the DRC, (Zaire) and the Ndop, resist dyed indigo cloth from the Bamileke of Cameroon (Ibid., 2010).

Although the authenticity of African traditional textiles, especially those that were produced around the 19th century has generated some controversy, the creative indigenous under tone that inspired and defined their production have been universally appraised nonetheless. Some of these fabrics, like the popular Dutch Wax prints, for example, have been clouded by a complex and culturally diverse history “actually spanning over centuries, across three continents and bridging various power structures”(Eccentric Yoruba, 2011). Heather Marie Akou (2009:9) equally observes that: “Despite abundant evidence of their cultural importance, textiles have invariably been relegated to a secondary status in Western assessments of African art. Ironically, this has occurred while traditional patronage of sculpture—the African art form most valued outside of Africa— has declined in most of the continent over the last century. The production of textiles, in contrast, continues to be a vital creative activity and attracts a great demand across West Africa.” Still they have not only been adopted by many cultures within the continent but have become a vital symbol of their respective socio-cultural identity.

Evidently, African art and African textile designs are not new to global art practice, on the contrary, what is relatively new on the global stage are African artists and fashion designers deservedly operating with a creative autonomy that has not been seen before. African indigenous textiles includes fabrics manufactured traditionally within the continent of Africa; all of the locally made fabrics produced within the preindustrial technological traditions of Africa using hand-
spun cotton; as well as industrially produced fiber such as machine-spun cotton and rayon. These locally made fabrics include substantial number of batik and printed textiles. African indigenous textiles provide more effective evidence of local aesthetics and artistic sensibilities than the much known media of sculpture and painting. It show evidence of a continuing and evolving tradition, traditional textile artists are always and will continue to be fully engaged in this creative activities as long as there are local and international demands. The word “design” is not an uncommon to the arts. It is a terminology that is often used in areas of the visual arts like textile, graphic, as well as other professional discipline like engineering and architecture. It is employed in all processes of purposeful visual creations which are coordinated together to make a meaningful whole, (Ogunduyile, 2007).

**The Socio-Cultural Significance of African Textile Designs**

In other to fully comprehend and appreciate the African textile designs, one needs to comprehend their significance, that is, what the primary intent for their creations is. Many African societies perceive textiles as a form of nonverbal communication that is they ‘speak’ through their clothes. Through a community’s style of textile, one can deduce information concerning their mutual association of spirituality, as well as historical or cultural identity. Most of the symbols and figurative compositions represent historical proverbs or events in the past, are a form of storytelling, through fabric artistically preaches importance of an individual, family or in large social unit. Furthermore, the motifs and designs have functional uses, which explain why most traditional societies and cults utilize them in their secret activities and political, social and religious occasions due to the secret messages embedded in them.

**Indigenous Textile Design:**

**A Contextual Delineation**

Attempting to explicate key terms that have been portrayed in the subject matter of this study is concerned, it is imperative to construe them into a conflation of selected key terms, which when properly addressed will consequently result into a satisfactorily exploration of the subject of this paper. These terms which for the sake of this paper, will be altered to also indicate rather narrow meanings as well include: “ingenious” and “Textile Design”.

The first term, which is “indigenous”, according to (Melchias, 2001:35), refers to “a culturally distinct ethnic groups with a different identity from the national society, draw existence from local resources and are politically non dominant”. While the World Bank (1991) asserts that indigenous peoples are are “social groups with a social and cultural identity distinct from the dominant society that makes vulnerability to being disadvantaged by the development process”, the United Nations argue that “indigenous communities, peoples and nations are those which, having a historical continuity with pre-invasion and precolonial societies that developed on their territories, consider themselves distinct from other sectors of the societies now prevailing in those territories, or parts of them” (Cobo, 1987).

![Fig. 1. A woman weaving Akwete cloth in the Ndoki town](http://www.vanguardngr.com/2012/07/akwete-cloth-an-igbo-textile-art/)

![Fig. 2. “Adire Design” © Arikwings.com](http://www.adireafricanart.com/adinkraintroduction.htm)

![Fig. 3. “Truedevinity “ Kente cloth”.Copy of diasporicroots.tumblr.com](http://www.adireafricanart.com/adinkraintroduction.htm)

Nevertheless, despite the burgeoning interest directed towards these indigenous textiles produced in the continent, there are certain factors or threats that could forestall their development. Among these is the present inclination of the world towards globalization and acculturation, whereby
unique cultural identities among diverse cultures in the world are compromised for universally accepted concepts in creativity. Furthermore technology is also downplaying the unique ingenuity that is birthed through artistry, making most textile designs like glorified crafts intended for commercial reasons alone. Other factors include the fact that the present day African tends to appreciate western textile and fashion trends, an attribute that was seeded in our consciousness during the colonialism that African art is inferior to the west. Youths nowadays, intrigued by the outstanding creations of the west and the hype that is accorded to some celebrities often give more preference for their dressing patterns. The present admiration, appreciation and quest for the acquisition of these African indigenous textile materials and its current positive status has over the decades resulted in laudable exhibitions, acquisitions and documentation of such textile materials as antiques. However, whenever there is discussion about contribution to world culture or civilization, Africa can reflect on her traditional art which includes her indigenous textile ideas, forms and materials. This reflection includes the continued growth of African textile and fashion industries and its concerns in the global fashion and art exhibition arena, a magnanimous contribution, which is still surprising the western world today. Several decades since the emergence of post-modern art in Europe, many successful artists, especially African artists and those of the Diaspora, still have continued to allude to the rich African indigenous textiles design ideas as their major source of design concepts and inspirations for their studio art practices.

Throughout the African history, these indigenous textile productions have, more than any other traditional African idioms of expression, circulated widely and across vast distances through trade and other means of exchange networks, stimulating even local artists to develop and explore new techniques, creative ideas and artistic designs in them. Its design and production fluidity absorbs innovations and transcends cultural boundaries. Its production ideas, designs and motifs are indigenous to the ethnic groups or West African communities that produce them.

**Conclusion**

At the turn of the century, many contemporary African designers have gone back to their roots to also innovate on the indigenous aesthetics that define these traditional textile designs in an attempt to integrate them into contemporary fashion trends. There are a variety of reasons for this inclination, which include reasons like the need to project and preserve socio-cultural identity, the need to convey known values for posterity, the need to appease a growing market among others.

In other to curtail these threats, the researcher recommends that strategic steps be taken to continually reorient the present day peoples residing within the continent on the unique attributes that are associated with the indigenous African socio-cultural textile art forms. Furthermore, in terms of art criticism and cultural based studies in aesthetics, there is a need to identify ways through which the current conventional anthropological and art historical approaches are construed to adopt the worldview and values of the African peoples. In other words, African art should be interpreted from the intrinsic cultural viewpoint rather than from the western perspective.

Finally the funds for the hosting of art exhibitions and provision of art grants for aspiring textile designers should be encouraged. Talent shows that are directed towards creativity in indigenous like the ones currently done in music ad movies, that is the African idol and Nigeria’s got talent and so one, should equally be hosted by the various government and private companies located within the continent.

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The Duration of Pleasure in the Experience of Beauty

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Abstract

We measure the time course of pleasure in the experience of beautiful art. Observers pick an artwork that is beautiful to them. We ask the observer to rate the pleasure experienced from the stimulus continuously for two minutes. After two minutes, we remove the stimulus and we ask the observer to rate the lingering pleasure for another two minutes. We fit an exponential to the decaying pleasure, after stimulus offset. We find that high, long-lasting pleasure is a hallmark of the beauty experience, absent for less-than-beautiful objects. Furthermore, we have discovered several “beauty knockout” conditions that abolish high, long-lingering pleasure, and hardly affect lesser pleasures.

Keywords: beauty; experience; pleasure; mood; duration; time course; decay.
Exogenous Attention Influences Aesthetic Evaluation

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Abstract

This study investigated the influence of exogenous attention on aesthetic judgments. We observed that abstract patterns are evaluated as more beautiful when presented at the same location as an exogenous cue. This was the case even when the target (a circle) was different from the pattern to be evaluated, but only when this pattern was presented at the attended location. This validity effect is linked to an overt shift of attention, and it disappears with longer intervals between cue offset and pattern appearance. In particular, results suggest that the invalid cue condition leads to more negative evaluation of a pattern.

Keywords: Exogenous attention; Aesthetic evaluation; Abstract patterns; Validity Effect; Overt attention; Stimulus Onset Asynchrony.

Introduction

Aesthetic experience is multifactorial and subject to a number of stimulus-, person- and situation-related influences (Jacobsen, 2010). Selective attention is a good candidate to affect the emotional value of items (see Fenske & Raymond, 2006). Exogenous attention usually refers to a shift of attention triggered by a salient sensory input, and it results in enhanced processing and consciousness (for a review see Carrasco, 2011). In this study we were interested to see whether the effect of exogenous attention could be extended to emotional processing. In other words, our main question was: would people rate abstract patterns presented at the location indicated by an exogenous cue as more beautiful than patterns presented elsewhere?

In a series of 5 studies we employed a version of the classic Posner’s paradigm (Posner, 1980). Targets were complex but meaningless patterns presented at the same or opposite location as a bright cue. Participants judged the patterns aesthetically. Experiments 1 measured the attentional cuing effect on response time (discrimination task), and on aesthetic evaluation of a given pattern. We then compared these two effects. The analysis of the validity effect (i.e., difference in mean ratings between valid and invalid trials) against μ=0 (absence of difference) allowed us to assess the strength of the effect on aesthetic evaluation. Target stimuli consisted of abstract patterns, with either a random or a bilateral symmetric configuration. For most people there is a preference for symmetrical stimuli. This effect is not a central interest in this study but it allowed us to test the role of cuing for stimuli that were generally disliked (random) and stimuli that were generally liked (symmetry).

Experiment 3 repeated the experiment by analyzing the attentional cuing effect on valid and invalid trials as compared to non-cued trials. In classical tasks of exogenous attention the interval between cue offset and target onset (Inter-stimulus Interval, ISI) is critical. When ISI increases, facilitation for cued location declines until a threshold level, after which facilitation for the un-cued location can emerge. This phenomenon is called Inhibition of Return (IOR) (Posner & Cohen, 1984). Experiment 2 tested the effects of increasing ISI on performance and pattern evaluation.

A second group of experiments (Experiments 4 and 5) tested whether the cuing effect on aesthetic evaluation extended to non-target patterns presented after a valid/invalid trial. In this case the target was a simple circle and participants detected its location. In Experiment 4 patterns were presented always at fixation. In Experiment 5 they appeared at target location. Salient stimuli trigger the planning of oculomotor responses, although stimuli can be attended covertly (the saccade is inhibited) or overtly (the saccade is performed). Ventral frontal cortex (VFC) mediates exogenous orienting of attention (Corbetta & Shulman, 2002) and the emotional consequences of inhibitory control of prepared motor responses (see Elliott et al., 2000 for a review). In experiments 1b, 4b and 5b participants were instructed not to move their eyes to the target location. Therefore these experiments tested whether suppressing the execution of a saccade influenced the effect of exogenous attention on aesthetic evaluation.

Experiment 1a [overt], 1b [covert]

This study investigated whether orienting attention towards a cued location changes the affective evaluation of a stimulus. The stimuli used were abstract patterns of two types: random and symmetrical.

In Experiment 1a participants performed a saccade towards the patterns before giving their response (overt). In Experiment 1b participants maintained fixation throughout the trial (covert).

Method and Analysis

Participants. Forty naïve participants took part (11 males, 5 left handed, age 17-34 μ=22). Half of them did Experiment
1a, the other half did Experiment 1b. All the experiments reported here were approved by the Ethics Committee of the University of Liverpool and conducted in accordance with the Declaration of Helsinki (2008).

Apparatus, stimuli and procedure Participants sat in front of a 16-in monitor with 75Hz refreshing rate and 1280X1024 resolution. An infrared eye-tracking camera sampled left eyes movements at 120Hz (ASL). Stimuli were generated using Psychopy software (Peirce, 2007).

Figure 1A shows the sequence of events in a trial. Trials started with a white fixation cross over dark grey background (Inter Stimulus Interval: 1 - 2s). A peripheral uninformative cue flashed for 100ms either on the left or right. The cue consisted of an increase in brightness modulated by a Gaussian envelope with size ~ 9 deg. The center of the cue was at an eccentricity of 9.6 deg from the fixation cross. Target stimuli appeared after an Inter Stimulus Interval (ISI) of 50ms, either at the same location of the cue (valid condition) or at the opposite location (invalid condition).

Target stimuli consisted of a black and white checkerboard (10X10), with either a random or a bilateral symmetric configuration. The size of the square pattern was 10.3 deg with center located at the same eccentricity as the cue. Participants used a gamepad to give their response and pressed one button for ‘symmetry’ and another button for ‘random’. Patterns remained on screen for 1.5s, in this way we ensured all patterns were observed for the same amount of time. All participants were instructed to keep fixation on the central cross until pattern appearance. In Experiment 1a participants overtly shifted their attention to the pattern and observed the pattern foveally. In Experiment 1b, participants maintained fixation on the cross and attended to the patterns covertly. A central 9-points rating scale followed, and participants rated aesthetically the patterns (9 corresponded to “like very much” and 1 was for “did not like at all”), moving with the directional buttons up/down on the scale (Fig. 1C). Both experiments consisted of 128 trials, with 64 valid trials and 64 invalid trials. 32 symmetry and 32 random patterns were presented in each validity condition. Cue and patterns left/right location was counterbalanced across trials. Note that no participant ever saw the same pattern more than once. However all participants saw the same patterns. Pattern presentation was balanced across all conditions. In this way we ensured that comparisons between valid and invalid conditions would have been made on the same patterns avoiding the risk of mere exposure and familiarity (Bornstein, 1989).

Analysis 2X2X2 mixed ANOVA was performed with Experiment (1a-overt, 1b-covert) as between-subject factor and Validity (invalid, valid) and Pattern regularity (random, symmetry) as within-subject factors. Dependent variables were accuracy and manual RTs (overall performance) and preference ratings (aesthetic evaluation).

8.8% of trials were excluded from the analysis in Experiment 1a, and 8.4% of trials were excluded in Experiment 1b. These trials include data loss, missed and anticipated responses, and incorrect eye movements. The proportion of analyzed trials in each condition remained equally distributed.

Results and Discussion

Overall Performance. Accuracy analysis revealed a main effect of Experiment (F (2,38) = 10.357, p=.003, η²p = .21). Participants were more accurate when overtly attended to the pattern in Experiment 1 (µ ± SE, 96.1 ± 1.0) than covertly (µ ± SE, 91.5 ± 1.0). Neither main effect of Validity nor other main effects and interactions were found (p > .1).

Analysis of manual RTs on correct trials revealed main effect of Validity (F (1,39) = 34.135, p<.001, η²p = .47), with faster RTs on valid trials than on invalid trials. There was also main effect of Experiment (F (2,38) = 6.423, p<.001, η²p = .47). Participants performing the experiment in covert generally gave faster responses (µ ± SE,.790 ± .02) than participants who observed patterns foveally (µ ± SE,.860 ± .02). Finally there was a weak interaction Experiment X Validity (F (2,38)= 4.098, p= .05, η²p = .10), as the difference between valid and invalid trials was greater in Experiment 1a(overt) (Invalid vs. valid: 1a(overt): .778 ± .02 vs. .802 ± .02; 1b(covert): .835 ± .02 vs. .884 ± .02).

Discussion Results can be summarized as follow: First, RTs were faster on valid trials than invalid trials. Accuracy was similar in both conditions. As expected, exogenous cuing of attention led to faster responses in the discrimination of pattern regularity. Moreover, the interaction between validity and experiment on RTs suggests that exogenous cues are more effective in improving perceptual discrimination if a spontaneous saccade towards the attended location is performed.

Aesthetic Evaluation. The main effect of Validity was significant (F (1,39) = 11.144, p=.002, η²p = .22). Overall participants gave higher ratings to patterns presented at the cued location. The main effect of regularity was also significant (F (1,39) = 83.587, p<.001, η²p = .69), as symmetry was liked more than random (µ ± SE, valid 6.3 ± .11 invalid 4.1 ± .16). The main effect of Experiment and interaction Experiment X Validity were not significant (p >.1). However, we computed the difference between mean ratings on valid trials and mean ratings on invalid trials (validity effect, VE). VE was tested against µ=0 (absence of effect, i.e. no difference valid-invalid), separately for the two experiments, and revealed significant positive difference in Experiment 1 (t (19) = 2.993; p = .007) but not in Experiment 2 (t (19) = 1. 151; p = .264) (see Fig. 2, upper panel). Finally, there was an interaction Experiment X Pattern Regularity (F (2,38) = 6.321, p= .016, η²p = .14), as the difference between random and symmetry was greater when participants used peripheral vision to attend to the patterns. A tendency to use more extreme values in covert conditions (covert vs. overt: symmetry 6.5 ± .16 vs. 6.9 ± .16; random 3.7 ± .23 vs. 4.5 ± .23), suggests evaluation was biased in this context and generalized to the concepts of “symmetry” and “random”.

Discussion Overall these results show that exogenous cuing of attention affects aesthetic evaluation. Although participants used mainly the lower part of the rating scale for
random patterns and the upper part for symmetry, this effect was similar for both types of stimuli. Preference for valid patterns might thus be a byproduct of facilitatory effects on perceptual discrimination. The validity effect (mean ratings on valid trials – mean ratings on invalid trials) was significantly greater than zero only in Experiment 1, when participants overtly shifted attention towards the patterns. The inhibition of spontaneous oculomotor responses seemed to affect modulation of aesthetic evaluation. Moreover, participants in Experiment 2 were generally faster and less accurate, and their ratings were probably biased. Covert performance possibly increased task’s demand and this also affected the influence of exogenous attention on evaluation.

**Experiment 2a [ISI 475ms], 2b [ISI 900ms]**

In this second experiment we tested the effect of ISI on performance and pattern evaluation. The procedure was identical to Experiment 1 but the interval between cue offset and pattern onset was longer.

**Methods and Analysis**

Forty participants performed this study (6 males, 5 left handed, aged 17-22 μ=19). The apparatus and design were identical to Experiment 1a. The only variation was applied on the interval between cue offset and pattern onset (ISI). In Experiment 2a ISI was 475ms. In Experiment 2b ISI was 900ms. For each experiment a 2X2 repeated measure ANOVA with Validity (invalid, valid) and Pattern regularity (random, symmetry) as factors. Accuracy, manual RTs (overall performance) and aesthetic ratings (aesthetic evaluation) were the dependent variables.

In Experiment 2a 10% of trials were excluded from the analysis, and 6.6% of trials was excluded in Experiment 2b. The criterion of exclusion applied was the same of experiment 1. Note that in both experiments the proportion of remaining trials was similarly distributed across conditions.

**Results and Discussion**

**Overall Performance** Overall correct responses were 95.3% in Experiment 2a. Neither validity effect nor IOR were found on accuracy (F (1,19) = .073; p = .79, η² p = .004) and manual RTs (F (1,19) = .301; p = .59, η² p = .02). The correct responses in Experiment 2b were 95.6%. Again, neither validity effect nor IOR were found on accuracy (F (1,19) = .031; p = .86, η² p = .002) and manual RTs (F (1,19) = .135; p = .14, η² p = .11). No other main effect and interaction were found (p > .1).

**Aesthetic Evaluation** Results are shown in Fig. 2, lower panel. As observed for performance, the validity effect on aesthetic evaluation disappeared with increasing ISI (Experiment 2a: F (1,19) = .881, p = .36, η² p = .04; Experiment 2b: F (1,19) = .323; p = .58, η² p = .02). The main effect of pattern regularity was present in both experiments (Experiment 2a: F (1,19) = 54.713, p<.001, η² p = .742; Experiment 2b: F (1,19) = 70.228; p = <.001, η² p = .787).

**Discussion.** Overall these null results confirmed that increasing the interval between cue offset and pattern onset cancels advantage of valid over invalid. Moreover these results support the assumption that modulation of aesthetic evaluation reflects modulation of performance. The fact that Inhibition of Return was not observed on performance may be not surprising. Only one ISI was used in each experiment in order to keep the global design as more similar as possible to Experiment 1a. However, IOR is sensitive to the number of ISI employed within the same experiment (Cheal & Chastain, 2002). Maintaining the cue-to-pattern interval unvaried through the whole experiment may tune participants to that interval duration. Once attentional capture of the cue has declined, there may be no bias either against previously cued location or in favour of unexplored locations.

**Experiment 3**

The aims of Experiment 3 were: ensuring results observed in Experiment 1a could be replicated; testing whether the difference in evaluation originated form higher ratings for patterns on valid trials or lower ratings for patterns on invalid ratings.

**Methods and Analysis**

Twenty participants (4 males, 1 left handed, aged 18-26 μ= 19.4) took part. The experiment was identical to Experiment 1a. This time there was a third non-cue condition in which the fixation screen remained unvaried for the supposed cue interval. Therefore 33.3% of trials were valid, 33.3% were invalid and the remaining 33.3% were non-cued. A 3X2 repeated measure ANOVA was performed with two within-subject factors, Validity (invalid, valid, not-cued trials) and Pattern regularity (random vs. symmetry). Accuracy, manual RTs and aesthetic ratings were analyzed. 9.1% of trials were discarded, but this did not change the overall distribution of trials across conditions.

**Results and Discussion**

**Overall Performance.** The 94% of responses was accurate. No significant results were obtained from the analysis of accuracy (p > .1). A significant effect emerged on RTs (F (1,19) = 19.432; p<.001, η² p = .506). Pairwise comparisons showed significant difference valid – invalid (μ± SE, -.058 ± .008, p < .001) and valid – non-cued (μ± SE, -.048 ± .01, p = .001). The difference invalid – non-cued was not significant (μ± SE, .012 ± .011, p = .85), suggesting a strong facilitation effect of cuing. No other main effects and interactions were found (p > .1).

**Aesthetic Evaluation** The main effect of validity was significant (F (1,19) = 7.270; p < .002, η² p = .277). Pairwise comparisons showed that difference valid – invalid was significant (μ± SE, .22 ± .06, p = .005). Difference invalid – non-cued was also significant (μ± SE, -.151 ± .05, p = .03), but valid – non-cued was not significant (μ± SE, .073 ± .065, p = .8) (See Fig. 3). Except for the main effect of regularity (F (1,19) = 37.920; p<.001, η² p = .666) no other main effects and interaction were found (p > .1).
Discussion. This experiment replicated the main results observed in Experiment 1a. However, we observed inconsistency between results obtained on RTs and aesthetic evaluation. RTs analysis showed clear advantage of valid trials over non-cued and invalid trials. RTs on invalid trials and non-cued trials were similar. Aesthetic evaluation had different trend. Invalid patterns were liked less than valid and non-cued patterns, whereas ratings on valid and non-cued trials were similar. This suggests that modulation on emotional processing may not reflect facilitation on perceptual processing, but originate from a violation of stimulus-response association in invalid trials (Nobre et al., 1999).

Experiment 4a [overt], 4b [covert]
This experiment was designed to test response-reward association after the execution of a valid/invalid trial. It consisted of a simple target detection task. To-be-evaluated patterns were presented at fixation. Participants observed the patterns and then evaluated them aesthetically. Like in Experiment 1, oculomotor responses were controlled.

Methods and Analysis
Forty naïve participants took part in this study (10 males, 4 left handed, aged 18-43, μ=24.8). Apparatus and stimuli were similar to Experiment 1a,b and shown in Fig. 1B. This time the uninformative cue was followed by a white circle (radius ~ 3deg), presented after an interval of 50ms at the same eccentricity of the cue (9.6deg). Participants reported the location of the target (left/right) as fast and accurate as possible. After response, the circle disappeared and an abstract pattern was shown at fixation for 1.5s. In Experiment 4a, twenty participants attended the targets overtly and performed a saccade back to fixation to observe the patterns, whereas in Experiment 4b they never moved the eyes from fixation. Participants rated the pattern they had just observed on a 9-point rating scale (Fig. 1C). Each experiment consisted of 128 trials. Cues, targets and patterns appearance was balanced so that there were an equal number of trials for each condition.

We carried out a 2X2 mixed ANOVA with Experiment (4a-overt, 4b-covert) as between-subject factor and Validity (invalid, valid) as within-subject factor on accuracy and manual RTs. 2X2X2 mixed ANOVA was conducted on the analysis of aesthetic evaluation, adding Pattern regularity (random, symmetry) as within-subject factor. The 9.2% of the total original trials was excluded from the analysis, however the proportion of trials on each condition did not differ.

Results and Discussion
Overall Performance Accuracy analysis showed main effect of validity (F (1,39) = 14.188, p = .001, η_p^2 = .27), with responses more accurate on valid trials than invalid trials (μ ± SE, valid 98.7 ± .3 vs. invalid 95.2 ± .9). There was main effect of Experiment (F (2,38) = 6.495, p = .02, η_p^2 = .146). Participants were overall more accurate when overtly attended the target (μ ± SE, overt 98.2 ± .7 vs. covert 95.6 ± .7). The interaction Experiment X Validity was also significant (F (2,38) = 6.947, p= .01, η_p^2 = .155), as the validity effect was stronger in Experiment 4b (covert) (invalid vs. valid: 4a(overt): 97.7 ± 1.3 vs. 98.7 ± .45; 4b(covert): 92.7 ± 1.3 vs. 98.6 ± .45)

Analysis of manual RTs revealed main effect of validity (F (1,39) = 21.673, p < .001, η_p^2 = .36), with faster RTs in valid trials than invalid trials (μ ± SE, valid 468 ± .017 vs. invalid 438 ± .015). The main effect of Experiment (F (2,38) < .1, n.s) and the interaction with Validity (F (2,38) = 1.407, p = .24, η_p^2 = .036) were not significant.

Discussion Results on performance show an advantage for valid trials on target detection. The effect on accuracy was present only when participants covertly attended to the targets. There was a bias to give wrong responses on invalid trials. RTs for valid trials were faster than RTs for invalid trials in both experiments.

Aesthetic Evaluation The main effect of Pattern regularity was significant (F (1,39) = 12.472, p=.001, η_p^2 = .25). The main effect of Validity was slightly significant (F (1,39) = 4.142, p=.049, η_p^2 = .098). The main effect of Experiment was not significant (F (2,38) = 1.902, p=.18, η_p^2 = .048) and also there were no significant interactions (p >.1). Like in Experiment 1a,b, the validity effect (VE) was tested against μ=0. No significances were found on both experiments (4a(overt): t (19) = 1.254; p = .225; 4b(covert); t (19) = 1.888; p = .07).(See Fig. 4 upper panel).

Discussion. This study revealed preference modulation for non-target stimuli presented immediately after a valid/invalid trial was weak (VE was not significantly different from zero in both experiments).

Considering results obtained so far, it is unlikely that affective responses are attributed only to targets representation and cannot be extended to task-irrelevant items. More suitable interpretation could be:

- Affective responses are associated to the cued location. As attentional facilitation is sensitive to the spatial correspondence between cue and target (Lambert and Duddy, 2002), emotional modulation may involve specifically the hemifield where the focus of attention was directed to.

- On each trial, participants shifted the focus of attention from the valid/invalid location toward an expected location (fixation). Possibly, this resets the emotional resources involved in the exogenous cuing task.

In the following experiment we addressed these hypothesis and presented the to-be-evaluated pattern at the same location of the target.

Experiment 5a [overt], 5b [covert]
The experiment was similar to Experiment 4, but this time patterns were presented at the same location of the target.

Methods and Analysis
Forty naïve participants took part (6 males, 3 left handed, aged 18-30, μ=21.5). Stimuli and design were similar to Experiment 4. This time the to-be-evaluated patterns appeared at target location, with the center falling at the same
e eccentricity of cues and targets. (9.6deg). Note that in Experiment 5a twenty participants moved eyes toward the target, and kept eyes at that location until the to-be-evaluated pattern disappeared. In Experiment 5b they never moved eyes from fixation. 7.3% of trials were excluded.

Results and Discussion

Overall Performance There was significant main effect of Validity both on accuracy (F(1,39) = 11.309, p = .002, η_p^2 = .23) and manual RTs (F(1,39) = 17.406, p < .001, η_p^2 = .314). Neither main effect of Experiment nor any interactions were found (p > .1).

Aesthetic Evaluation The main effect of Validity was significant (F(1,39) = 9.784, p = .003, η_p^2 = .21). There was no main effect of Experiment and interaction Experiment X Validity (p > .1). However, we calculated a validity effect VE and tested it against µ=0. A significant difference was obtained in Experiment 5a (overt) (µ = .18, SD = .28 t(19) = 2.802, p = .01), but not in Experiment 5b (µ = .10, SD = .38 t(19) = 1.377, p = .28) (see Fig 4 right lower panel). The main effect of Pattern regularity was significant (F(1,39) = 75.655, p < .001, η_p^2 = .67). The only significant interaction was Pattern regularity X Validity (F(1,39) = 6.987, p = .012, η_p^2 = .16); the validity effect was present only for symmetry (valid vs. invalid: symmetry 6.11 ± .16 vs. 5.86 ± .16; random 3.72 ± .17 vs. 3.67 ± .17). All other interactions were not significant (p > .1).

Discussion. An advantage for valid over invalid trials was obtained on accuracy, RTs and aesthetic evaluation. These results confirmed that preference is not strictly related to the target, but extends to task-irrelevant items presented immediately afterwards. Although the effect Experiment did not interact with Validity in the modulation of aesthetic evaluation, the validity effect was present only for symmetry (valid vs. invalid), which suggests that the validity effect originates from a negative emotional response to the invalid condition, rather than facilitation in the perceptual processing of the target. Norbre et al. (1999) showed engagement of the Orbitofrontal cortex on invalid trials, which may implicate changes of the emotional state. Experiment 4 and Experiment 5 showed a validity effect on non-target patterns presented immediately after a valid/invalid trial. These latter results suggest that stimulus-response association (and consequently response-avoid associations) elicit changes in the emotional state, which are misattributed to other items.

Acknowledgments

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References


Figures

**Figure 1**: Trial structure. Exogenous cues flashed for 100ms and were uninformative (50% invalid 50% valid) in all experiments. The inter-stimulus interval (ISI) was 50 ms in all Experiments. Only in Experiment 2a ISI was 475ms, and in Experiment 2b ISI was 900ms. Panel A shows trial sequence of Experiments 1a,b and Experiment 2a,b. Patterns were the targets and participants discriminated between symmetry and random. On each trial, a novel pattern was generated, so no participant ever saw the same pattern twice. Panel B shows trial sequence of Experiment 4a,b and Experiment 5a,b. Participants detected location of targets (white circles). In Experiment 4a,b patterns appeared at fixation. In Experiment 5a,b patterns appeared at target location. Panel C shows an example of the rating scale, which was the same on all experiments.

**Figure 2**: Upper Panel: results for Experiment 1a,b. Right. Line chart illustrating aesthetic ratings on valid trials (green line) and invalid trials (blue line) plotted against Experiment 1a (overt) and Experiment 1b (covert). Asterisks highlight significant main difference valid - invalid. Left. Bar chart illustrating the validity effect $VE$ (with standard errors bars) computed as the difference between mean ratings in valid trials – mean ratings on invalid trials, for both experiments. Asterisks indicate significant difference from $\mu = 0$. Lower Panel (right, left) shows Results for Experiment 2a (ISI 475ms) and Experiment 2b (ISI 900ms). * $p < .05$; ** $p < .01$; *** $p < .001$.

**Figure 3**: results from Experiment 3. Bar chart illustrates mean aesthetic ratings on valid, invalid and non-cued conditions. Non-cued condition indicates the origin in order to highlight the difference between valid – non-cued (left) and invalid – non-cued (right). Asterisks indicate significant differences between conditions. * $p < .05$; ** $p < .01$; *** $p < .001$.

**Figure 4**: Upper Panel: results for Experiment 4a,b. Right. Line chart illustrating aesthetic ratings on valid trials (green line) and invalid trials (blue line) plotted against Experiment 4a (overt) and Experiment 4b (covert). Left. Bar chart illustrating the validity effect $VE$ (with standard errors bars), for both experiments. Lower Panel (right, left) shows Results for Experiment 5a (overt) and Experiment 2b (covert).
Attractive Faces Move Us

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Abstract

Beautiful objects move us emotionally. We hypothesized that attractive faces move our bodies literally and tested this hypothesis by recording eye and hand movements. In two experiments, participants chose the narrow face of a pair of faces while we tracked their eye movements (Experiment 1) and their arm movements (Experiment 2). For half the pairs, the expected choice was the attractive face (congruent trial) and for the other half it was the unattractive face (incongruent trials). Results showed that participants fixated more on attractive faces in both types of trials and that their hands deviated towards attractive faces when this wasn’t the final choice. Our results suggest that the implicit effects of beauty are ingrained even in our motor systems.

Keywords: beauty; choice; facial attractiveness; faces.

Introduction

“Beauty awakens the soul to act”
-Dante Alighieri

A beautiful object, such as a flower, a poem, or a smiling face can capture our attention and move us emotionally. From an early age, we prefer to look at beautiful faces and many choose to surround themselves with aesthetically pleasing objects. For example, 1-month old babies prefer to look at beautiful faces as evidenced by the position of their heads and eyes (Langlois, 1987; Langlois, 1990). In addition, beautiful faces attract our attention even when they are presented in our peripheral vision (Guo et al., 2011). Research has demonstrated that beautiful objects, such as paintings, also draw our eyes in their direction (Massaro et al., 2012). We prefer beautiful objects and people throughout our lifespan (Zebrowitz, 1999). We exhibit this preference even when we are unaware of it (Christian, 2013). Neural responses to beautiful faces occur even when people are engaged in an unrelated task (Kim et al., 2007, Chatterjee, et al. 2009). Our preference for beauty is automatic and is exhibited from early on in our lives.

Our actions and decisions are also influenced by our preference for aesthetically pleasing objects. For example, we prefer to buy aesthetically pleasing objects and marketing is more successful when attractive people advertise and endorse products (Baker and Churchill, 1977; Caballero and Pride, 1984; Caballero et al., 1989). When deciding who to interact with, we prefer beautiful people and affiliate with faces we rate as highly attractive. In addition, we attribute positive characteristics to attractive people and we tend to judge them less severely when they’ve committed an offense (DeSantis and Kayson, 1997; Efran, 1974; Esses and Webster, 1988). Our preference for beauty shapes our social and economic decisions. Although ample research demonstrates that preference for beauty shapes our decisions and behavior, the extent to which this preference for beauty is embedded in our motor systems is not clear.

The limited amount of research in this area may be because until recently, motor control and research on movement and action were neglected by psychology (Rosenbaum, 2005). Motor control and movements were seen as a mere result of cognitive processes. Nevertheless, research using movement tracking methods shows that our movements can index and shape complex cognitive processes such as social evaluation and categorization (Freeman and Ambady, 2011; Van Bavel et al., 2009).
Because beautiful faces attract our attention, we predicted that eye and hand trajectories in an unrelated judgment task would be influenced by our attraction to beautiful faces. However, given that copious research demonstrates that we selectively inhibit movements (Coxon et al., 2007) it might also be that beautiful faces do not affect deflections of the hand while making a judgment unrelated to attractiveness. It might also be the case that we see effects in eye movements and not in limb movements either because visuo-motor links are stronger for vision to eye movement systems than vision to limb movement systems or because eye movement recordings are more sensitive measures of movement biases than limb movements.

Methods

Stimuli

Faces Faces were obtained from open source websites and were used with the permission of the photographers. The set was mostly composed of photographs obtained from www.faceoftomorrow.org. All pictures were grayscaled, resized, cropped and mounted on a 400 x 400 pixel white background using Photoshop Elements.

Attractiveness Norming 120 standardized photographs were presented to a group of participants (N=15) in order to obtain attractiveness ratings. Participants rated each one of the faces on a 1 to 7 likert scale where 1 was extremely unattractive and 7 was extremely attractive. Attractiveness ratings for our set were normally distributed. Once we had the results of this norming, we used the pictures that had the highest inter-rater agreement to compose the attractiveness and face dimensions pairs. Faces that were rated as a 1 or 2 were considered on the low end of the attractiveness scale while faces rated as 6 or 7 were considered high on the attractiveness scale.

Attractiveness Pairs For The Dimensions Task For the main task, we presented participants with a pair of faces and asked them to choose the narrower face of each pair. For each pair, we selected a high attractiveness and a low attractiveness face. For half of the face pairs, the narrower face was the attractive face of the pair. Pairs where the expected choice was the attractive face were labeled as congruent trials. For the second half of the face pairs, the incongruent trials, the narrower face was the unattractive face of the pair. For both congruent and incongruent trials the correct or expected choice was counterbalanced to appear in the top-left or top-right corners of the screen. The pairs for this task were designed so that the factor attractiveness and face width were orthogonal to each other. As with the attractiveness pairs, 20 pairs were composed of female photographs while the other 20 were composed of male photographs.

Face Dimensions Eye-Tracking

Participants were 15 young adults between the ages of 18 and 32 years (Mean ± Standard Deviation (SD) = 22.56 ± 5.65; 9 right handed females and 6 right handed males). Participants were recruited through the University of Pennsylvania and received either monetary compensation or course credit for their participation.

In each session, participants completed sets of 40 practice trials for the Facial Dimensions task until they performed at an accuracy of .85 or higher before the main task. In order to validate our previous norming of the faces, participants also performed the attractiveness task where they were to choose the more attractive face of each pair. The order in which participants performed the face dimensions task and the attractiveness task was counterbalanced across participants.

For each trial in the facial dimensions task, participants focused on a fixation cross at the bottom center of the screen until they saw a purple box around the fixation cross and the faces appeared. The purple box signaled a successful fixation and thus ensured successful and accurate tracking. Face pairs were presented in random order, and participants were asked to pick the narrower face of each pair by pressing one of two buttons on a keyboard (1, 2). For each trial, eye movements were recorded at a frequency of 120 Hz from the moment that the faces appeared on the screen to the moment where participants clicked on their choice.

Face Dimensions Mouse-Tracking

Participants were 15 young adults between the ages of 18 and 41 years (Mean ± Standard Deviation (SD) = 22.56 ± 5.65; 8 right handed females and 7 right handed males). Participants were recruited through the University of Pennsylvania and received either monetary compensation or course credit for their participation.

In each session, participants completed 40 practice trials for the Facial Dimensions task until they performed at an accuracy of .85 or more before the main task. In order to validate our previous norming of the faces, participants also performed the attractiveness task where they were to choose the more attractive face of each pair.

For each trial, participants used a computer mouse to click a “Start” button at the bottom-center of the screen, which was then replaced by a pair of faces. Face pairs were presented in a randomized order and participants were asked to click on the narrower face of the pair.

Results

Attractiveness Task

To test whether participants agreed with the attractiveness ratings of a previous norming task we computed the accuracy of participants in choosing the most attractive face of each pair in both the eye-tracking and the mouse-tracking experiments. Participants were accurate in selecting the most attractive face of each pair (M= 0.95). This suggests that
participants agreed with the attractiveness ratings obtained from the previous norming.

**Eye-Tracking**

Eye gaze and fixations were calculated for each trial and each face. We compared the number of fixations and dwelling times for attractive and unattractive faces in the incongruent trials. We found that participants fixated more (Mean number of fixations for attractive faces 42 while mean fixations for unattractive faces 34 paired t(16)=2.48, p=0.03) as compared to unattractive faces. This was true for both congruent and incongruent trials.

**Task Mouse-Tracking**

Trajectories were time-normalized and space-normalized to permit averaging across multiple trials. For each participant, we obtained an average trajectory for incongruent trials and an average trajectory for congruent trials. All trajectories were spaced normalized to permit averaging across trials where the final choice was on the top-right and top-left corners. To obtain a measure of movement bias towards the unselected face, we computed the area under the curve, which was taken as the distance between the actual mouse trajectory and an idealized straight-line trajectory (see Freeman and Ambady, 2010 for more about trajectory analyses). Congruent trials’ trajectories were more direct (M=0.49) than incongruent trials’ trajectories (M=0.94) (two-sample t(15.93)=2.36, p=0.03). This suggests that participants’ trajectories were less direct when they clicked on the unattractive face of each pair and that they were attracted to the attractive face of each pair.

**Discussion**

Beautiful faces move us. We hypothesized that the idea of being moved by facial attraction is not just a metaphor and would be expressed in the output of our motor systems. To test this hypothesis, we designed and eye-tracking and a mouse-tracking study to see if attractive faces engaged participants’ eyes and limbs when engaged in another task. The eye-tracking study revealed that participants fixated and dwelled more on attractive faces even when these faces were not the correct choice for the task. Similarly the mouse-tracking study revealed that participants’ hand movements were “pulled” toward the attractive face of the pair even when it was not the correct choice.

Previous studies have found that we prefer to look at faces we rate as more attractive and that attractive faces capture our attention (Maner et al, 2003; Langois et al, 1984; Leder et al, 2010). Some studies even suggest that our gaze is distracted towards attractive faces when we are performing an unrelated search task (Christian, 2014) or judgment (Chatterjee et al, 2009; Kim et al, 2007) and that attractive faces are better remembered and aid us in remembering events (Franklin and Adams, 2009). The results of our eye-tracking study corroborate that we look more and for a longer time at attractive faces. This is true even when we are not focused on attractiveness.

Previous research has shown that limb movements may be engaged implicitly during aesthetic experiences. For example, Lucio Fontana’s abstract paintings showing “cuts” in canvases engage the observers motor systems. Performing motor acts compatible with the style of paintings (pointillist or brushwork) influences people’s preference for artworks. These studies suggest that our motor systems implicitly simulate the actions involved in the creation of artwork. Our study demonstrates that socially relevant attractive visual objects engage our motor systems, not as simulation, but as an aspect of approach behaviors. Approach and avoidance is the most basic axis along which mobile organisms organize movements. Everyday experience suggests that we approach aesthetically pleasing objects and avoid aesthetically unpleasing things. Our study suggest that these effects are so deeply rooted in our behavioral repertoire that they are evident when presented with pictures (rather than the actual presence) of attractive people and participants’ are focused on a task that has nothing to do with attractiveness.

In conclusion, beauty moves us in a literal sense. The findings of these studies suggest that our preference and attraction to beauty is deeply engrained in our motor systems and behavior.

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**References**


Empirical Studies including Noise of Two Leading Journals in Music Research: A Review

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Abstract

From the beginning of the 20th century, noise became increasingly recognized as a musical phenomenon in itself. Particularly with Luigi Russolo’s manifesto L’arte dei rumori (1913) noise became a part of the musical sphere. This paper systematically reviews the empirical studies on noise in two leading journals in music research – Psychology of Music and Music Perception. Importantly, actually opposing definitions of what noise is, appear. While in most studies, noise is treated like a disturbing ‘anti-music’ phenomenon or simply as the control condition for music, in musical contexts the same physical stimulus is treated as a genuine musical phenomenon. In this paper I therefore propose that the original works of noise-music should be used as the basis of stimuli, in order to conduct studies that better help understand what music can be and how it is mentally constructed as music.

Keywords: Noise, white noise, control condition, pink noise, background noise, anti-music, music of the 20th Century, Noise Music

Introduction

In 1913 the Italian artist Luigi Russolo (1883–1947) proposed in his manifesto, L’arte dei rumori, that noise and music should no longer be regarded as opposites but that different kinds of noise should be used to make a genuinely contemporary music. In doing so he initiated the concept of noise being a musical phenomenon in itself. In the 20th century consequently noise became an important part of the musical sphere (Ross 2007), like in Pierre Schaeffer’s Étude aux chemins de fer (1948). At present, many musical works, like Mesami Akita’s and Merzbow’s Birds and Warhouse (2004) or Frank Bretschneider’s Flutter Flitter (2011), as well as theoretical books about music continue to be published, also discussing different forms and connotations of ‘noise’ (Hegarty 2007). Since the 1970s, noise has also become a part of various empirical studies concerning its interconnection with music. Insofar there is the question, whether this development in the field of music – the abolishment of the stringently differentiation of music and noise – is also reflected in these empirical studies, or whether there still exists the traditional dichotomy.

Analyzed Journals

This paper systematically reviews all the empirical studies involving noise in two leading journals in music research – Psychology of Music and Music Perception. The two journals were chosen because they worldwide have the deepest impact factor in music research. The paper establishes distinct categories regarding how noise so far has been used and understood. This includes the analysis of approaches, types of noise and types of use. As a conclusion, new perspectives for empirical and experimental studies in the field of noise and music are proposed.

Results

In Psychology of Music (PoM) and in Music Perception (MuP) only a few empirical studies included noise (PoM: 10/519, 1973–2010; MuP: 23/905, 1983–2010). The first study to include noise was published in PoM in 2003 and in MuP in 1984. It can therefore be seen that there was a big gap between the establishment of PoM in 1973 and the appearance of the first noise study in this journal, whereas there was less of a gap with MuP, since the first study appeared one year after its launch in 1983. The analyzed studies (1983–2010) show a broad area of subjects relating to noise and music that with regard to headline wording and keywords could be grouped into the following: I. Learning & musical development (PoM: 3/10; MuP: 2/23); II. Perception & cognition (PoM: 3/10; MuP: 5/23); III. Pitch, tonality & melody (PoM: 0/10; MuP: 11/23); IV. Timbre & sound (PoM: 0/10; MuP: 4/23), and V. other topics, including enjoyment of performance, extramusical associations, health, and auditory feedback (PoM: 4/10; MuP: 1/23). In PoM there were no studies about pitch, tonality, melody, or about timbre or sound, whereas in MuP most of the studies were about pitch, tonality or melody.

In the examined studies, different types of noise are mentioned: In some studies noise appears in an unspecific form, simply referred to as ‘noise’, unspecified ‘background noise’ or ‘environmental noise’. Specified ‘white noise’, ‘pink noise’ and ‘noise bands’ also appeared. More specified ‘background noise’, like ‘school background noise’ or ‘audience noise’, and specified noises like ‘bee noises’ or ‘keyclick noise’ are mentioned in 9 of all 33 studies. The mentioned types of noise can be described with three categories (see Fig. 1): I. Unspecified noise (PoM: 2/10; MuP: 4/23); II. Noise bands that include white noise, pink noise and specified frequency bands of noise (PoM: 2/10; MuP: 16/23); and III. Specified noise (PoM: 6/10; MuP: 3/23). It is interesting that in PoM, contrary to the MuP, the

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21 This kind of noise is constructed via mathematical models.
majority of studies described the kind of noise that was used, while in MuP the mathematical kind of noise, like white noise, appears more often.

There were also differences in how noise was used: Noise was taken either as the real stimulus, a control stimulus, a tonal eraser, or it appeared as a by-product. Therefore three categories regarding the use of noise are proposed (see Fig. 2): I. Noise as anti-music (PoM: 2/10; MuP: 15/23); II. Noise as itself, as an own category of stimulus, so to say noise as noise (PoM: 7/10; MuP: 6/23); and III. Noise as music (PoM: 1/10; MuP: 2/23). As a control stimulus and a tonal eraser, noise is treated like an anti-music phenomenon. That means that only in a few cases noise is treated as a part of a musical stimulus, and that in PoM more studies treated noise as itself, whereas in MuP, noise is mostly used as an anti-music control condition.

**Discussion**

It is observed that in contrast to recent musical practice and works and the history of noise music, there were only a very few studies in music research regarded noise as relating to music.22

Most of the studies did not focus on noise as a distinct musical category. This is closely related to the types of noise and how noise has been used. For example, the majority of studies about pitch, tonality or melody used noise as a tonal eraser, which should neutralize pitches. Therefore most of these studies employed white noise, pink noise, or noise bands. This also means that most of these studies did not care about noise as stimulus that could be a specific category of sound. But there were few studies about timbre or the quality of sound in which noise played a role as a quality, and not as control condition.

Regarding the types of noise that were used, it is remarkable that most of the so-called control conditions appeared as a part of music in the 20th century, or even earlier, in the 19th century. For example, white noise as the main control condition is also approximately present in many musical works, like James Tenney’s *Analog No. 1* (1961), Joji Yuasa’s *Projection Esemplastic for White Noise* (1964), Lou Reeds *Metal Machine Music* (1975), or the wind machine in Richard Strauss’s *Don Quixote* (1897, op. 35), which take white noise as a starting point of the musical work. Therefore the musical praxis of the last 100 years has changed our mode of listening that was fixed in the categorical opposition of noise and music.

Most of the studies include noise as a control stimulus, with no intention of examining the phenomenon of noise in itself. While in studies, noise is mostly treated like a disturbing ‘anti-music’ phenomenon or simply as the control condition for music, in musical contexts the same physical stimulus can be treated as a genuinely musical phenomenon. Hence, new questions would result in remunerating empirical

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22 I am working on a list, which includes all kind of noise music. Current it contains 516 items.
research: for example, ‘Is the ability to differentiate between noise and music biological, or could it be overcome by noise-music (therefore the differentiation would be a cultural and learnable phenomenon)?’, ‘At what account could noise be perceived as music?’, or ‘Could white noise as an anti-music control condition also be perceived as music by a group of the participants, and therefore should it be tested individually before it is employed as an control stimulus?’ The original works of noise-music should be used as the basis of stimuli, in order to conduct such studies that really help understand what music can be and how it is mentally constructed as music.

The examined studies in PoM and MuP show as an example that, until now, noise as music as a subject of empirical studies on music perception and cognition is unestablished. This is an outstanding opportunity for empirical studies to investigate perhaps one of the most important innovations in music of the 20th century: ‘musical noise’.

References


Comparing Angular and Smoothed Polygons. Exploring the Link Between Preference, Response Time and Contour Integration

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Abstract
Our two experiments aimed to understand the nature of preference for curvature over angularity. In Experiment 1 we investigated whether polygons are processed more fluently when they are changed into a smoothed version. This was a symmetry detection task where curvature was task-irrelevant. In Experiment 2 we tested whether the preference for curvature is present at a global configuration level or if it could be extended at a local level. We used shapes with local oriented Gabor patches and asked for preference rating. Results suggest that smooth contours made a shape easier to be processed (curved polygons were processed faster) and preferred as compared to angular contours. When contours had local oriented Gabors, global shape was the most important factor.

Keywords: Curved and angular shapes; global configuration; contour integration.

Introduction
It is known that there is a preference for curved objects over more angular objects (e.g. Silvia & Barona, 2009), however the origin of this effect is not well understood. One theory that could explain the preference for curves is the fluency hypothesis, that seem to explain other types of preference, like symmetry (Enquist & Arak, 1994). According to this view, processing fluency conveys positive affect, which determines the preference for the incoming stimulus (Reber & Schwartz, 2006). This theory assumes that features easy to process generate a subjective experience of perceptual fluency (Reber, Wurtz, & Zimmermann, 2004). To clarify this concept it is necessary to make a distinction between a fluent process and a stimulus that is easy to perceive. The former obeys the Gestalt principles (for review Wagemans et al., 2012), and is linked to the ease in accuracy of detection tasks. We call this objective fluency. On the other hand, an objectively fluent stimulus could be linked to a subjective fluent experience, e.g. an easy task to perform. This subjective fluency, even if it is outside consciousness, could be misattributed to the stimulus, resulting in a preference for that stimulus (Reber, Wurtz, & Zimmermann, 2004).

The aim of the present study was to verify if preference for curves can be explained by the fact that curved polygons are processed more efficiently than angular ones.

The first Experiment used a symmetry detection task. In the second Experiment instead we asked for preference ratings, but manipulated local orientation using Gabor patches. We know that when there are elements aligned along a smooth path (collinearity) sensitivity in a contour detection task increases (Field, Hayes, & Hess, 1993).

Experiment 1: Response Time to Curved and Angular
In Experiment 1 we generated random polygons. We manipulated these shapes to obtain an angular version (polygons) and a curved version (smoothed version of polygons). The task was to detect symmetry and therefore the curvature of the stimuli was task irrelevant. The aim was to test whether curved shapes are processed more or less efficiently than angular shapes. If curvature provides an advantage, we would expect the level of performance to be higher. We used a detection of symmetry task and measured reaction time, errors, and also a measure of sensitivity (d prime) to test our hypothesis.

Material and Method
Participants. Eighteen participants (age M=28 years, range 18 to 48, 9 females, 9 males) volunteered and gave informed consent before taking part in the experiment. All had normal or corrected-to-normal vision. The experiment had received approval by the local ethics committee of the Department of Psychology, University of Liverpool and was conducted in accordance with the Declaration of Helsinki (revised 2008).

Stimuli and apparatus. Participants sat in a quiet and darkened room at approximately 57cm of distance from the
screen. Stimuli were presented on a 1280 X 1024 Apple StudioDisplay 21" Cathode Ray Tube (CRT) monitor at 60Hz.

A program written in Python and using Psychopy Version 1.78.01 (Peirce, 2007) controlled the experiment and also recorded participants’ responses. Our stimuli consisted of polygons with a black contour line presented on a white background. We manipulated the left and the right side so that each had 10 vertices. The positions on the left and right could be unrelated (random) or matched by a reflection (symmetry). In a separate condition the same polygons were smoothed using a cubic spline. Therefore vertices became peaks of curvature. In this way we obtained two matched versions of the same polygon. We refer to the two versions as 'angular' and 'curved'.

Moreover we controlled a third dimension, in one condition the left and right side formed a single object, in another condition we separated them in two objects (Fig. 1a for random and 1b for reflection).

To avoid any role of familiarity stimuli were never repeated and each trial presented a different stimulus.

![ANGULAR](image1)

**Fig. 1a:** Experiment 1: illustration of random polygons with Shape (angular vs. curved) x Closure (one object vs. two object).

**Experimental Design and Procedure.** A 2 (Shape: curved vs. angular) x 2 (Contour: symmetry vs. random) x 2 (Closure: one object vs. two object) within-subject design was used. Participants gave informed written consent before starting the experiment. They discriminated, as fast as possible, whether or not the shape presented on the screen was symmetrical. Each participant completed 8 practice trials, one trial per each version of the polygons before responding to the experimental trials (176 in total, 22 trials per each version).

Participants entered responses using two keys (‘a’ and ‘l’) of the keyboard. The key assignment ‘symmetrical’ and ‘non symmetrical’ was counterbalanced between-subjects in two versions of the task.

Stimuli were presented in a new random order. The procedure adopted for each trial had the following structure: a fixation cross appeared on the centre of the screen for 500 ms; then followed the target shape, which remained on the screen until a response was given.

**Analysis**

For each trial we analysed the reaction times: all the trials lower than 300 ms and greater than 5000 ms (0.7% in total) were excluded from our analysis. We performed a 2x2x2 repeated measures ANOVA with the following factors: Shape (curved, angular), Contour (symmetry, random) and Closure (one object, two object).

Moreover, we conducted a signal detection analysis (d’) and we performed a 2x2 repeated measures ANOVA on d’ data with the following factors: Shape (curved, angular) and Closure (one object, two object).
Results

Mean RT are shown in Figure 3. A repeated measures ANOVA on RT confirmed a main effect of Shape (F(17)=6.004, p<0.05), meaning that curved stimuli were processed faster than angular ones (Mean angular polygons=.94 sec; Mean curved polygons=.90 sec). We found also an interaction (F(17)=12.492, p<0.01) between Shape and Contour: angular shapes were detected more slowly when they were symmetrical (Mean= 1.00 sec), and relatively quickly when they were random (Mean=.88 sec).

Figure 3: Results of Experiment 1: The graph shows mean reaction times (y axis) for curved (blue) vs. angular (red) shapes in the closure (close: one object vs. open: two object) and in the regularity (random vs. reflection) conditions.

Moreover, we conducted a signal detection analysis that confirmed a trend for higher sensitivity for curved stimuli (polygon d’=2.46; curved d’=2.60), meaning that participants were more accurate to detect a curved shape when the congruent trial was presented. The c criterion showed that the subjects were more conservative for polygons (c=.03) than for curved shapes (c=.01). This means that participants were had the tendency to answer “random” instead of “symmetrical” when an angular polygon was presented compared to the curved counterpart.

Finally, we performed a repeated measures ANOVA with d’ data with the following factors: Shape (curved, angular) and Closure (one object, two object). We found a main effect of Closure (F(17)=1.665, p<0.05), meaning that participants were more sensitive when a single object was shown instead of two (Mean Close= 2.74; Mean Open= 2.44) (Fig. 4). The difference in sensitivity between angular and curved conditions was not statistically significant, but the difference was consistent with the reaction time (Mean d’ angular=2.535; Mean curved d’=2.650).

Figure 4: The graph shows mean errors to curved and angular shapes when they were presented in one or two objects.

Discussion

Results of Experiment 1 suggest that smoothed contours can make a shape easier to process and more accurate in the responses. On the other hand, we found that people are faster detecting an angular polygon in the random condition compared to the symmetrical one. This is possibly because angular shapes do not look as regular as their curved counterparts.

Experiment 2: Global and local curvature

In Experiment 2 we used shapes with a curved or a angular global configuration, which also contained a local structure. The latter was made of Gabor patches that could be collinear (snakes) or orthogonal (ladders) to the contour line of the shape. The rationale is that local collinearity is visually congruent with the contour line in both shapes. In contrast orthogonal patches are presented against the direction of the contour line. The prediction is that collinear patches would be preferred to orthogonal patches, although such as preference would be more enhanced for the angular shapes.

Material and Method

Participants. Twenty-three participants took part in Experiment 2 (age range: 18 – 27; 1 left handed; 19 females). All participants had normal or corrected to normal vision. They provided a written consent for taking part and received course credits. The experiment was approved by the Ethics Committee of the University of Liverpool and was conducted in accordance with the Declaration of Helsinki (2008).
Stimuli and apparatus. Stimuli consisted of irregular abstract shapes with a black contour line of 0.5 px, which could be curved or angular (global configuration). These final shapes were all generated from the ellipse. The local structure of the shapes consisted of Gabor patches (0.4 degree of visual angle), which were superimposed collinearly or orthogonally to the contour line. At a local level depending on the orientation of the Gabor patches the shapes appeared as curved or angular (see Figure 5).

Figure 5. Experiment 2: Illustration of the stimuli with Shape (angular vs. curved) x Configuration (collinear vs. orthogonal)

This manipulation is related to what is typically studied in contour integration experiments. These stimuli have become known as *snakes* (similar local orientation) and *ladders* (orthogonal local orientation) (Bex, Simmers & Dakin, 2001).

Participants sat at approximately 57cm of distance from the screen. Stimuli were presented on a 1280 X 1024 DELL M993s 19" Cathode Ray Tube (CRT) monitor at 60Hz.

Experimental Design and Procedure. A 2 x 2 x 2 within-subjects design was employed with as factors: Shape (angular vs. curved) Configuration (global vs. local) and Orientation (collinear, orthogonal). The experiment started with the instructions followed by the practice session (8 trials). Each trial started with a fixation cross at the center of a grey background for 500ms, then the image appeared and remained on screen until response. Inter-trial time ranged between 0.6 and 1.6 sec. The task was to rate preference on a visual scale ranging from ‘dislike’ (0) to ‘like’ (100) with a mouse click (Figure 6).

After the practice 160 experimental trials followed with novel images. The experiment lasted approximately 20 minutes.

Analysis

The experimental design presented three factors, including the orientation of the stimuli. However, orientation was only meant to add variability in the stimuli presentation and we did not have a specific hypothesis about its effect on preference. Therefore, a 2x2 repeated measures ANOVA was performed with Shape (angular vs. curved) and Configuration (global vs. local). Preference rating was the dependent variable.

Results

The results are illustrated in Figure 7. Descriptive statistics showed that mean responses on the 0 to 100 points scale ranged between 26.28 (low preference) and 58.41 (high preference).

The analyses revealed a main effect of Shape (F(1, 23)= 73.84, p=.000, $\eta^2_p$ = .762). Overall the curved shapes were...
preferred over the angular ones (curved: M= 58.87, SE= 2.90; angular: M= 34.58, SE= 1.95). The main effect of Configuration was also significant (F(1, 23)= 13.46, p=.001, ηp² = .369), suggesting that participants preferred Gabor patches which were collinear to the contour line as compared to orthogonal (collinear Gabor patches: M= 48.43, SE= 2.12; orthogonal Gabor patches: M= 45.12, SE= 2.03) independently of the type of shape. Importantly, configuration did not modulate preference with curved shapes (t(24)= 1.65, p= .113), but it did with angular shapes as the latter were even more disliked when presented angular Gabor patches than collinear ones (t(24)= 3.16, p= .004). The interaction of Shape by Configuration was not statistically significant (F(1, 23)= 2.48, p= .128, ηp² = .098).

Discussion
Experiment 2 explored the relation between curvature/angularity and the configuration of the shape (global or local). The data confirmed preference for global curvature, and also a preference for collinear Gabor orientation. However, there was no interaction and the effect sizes were very different. Global shape had a much greater effect on preference with a difference of 24.59. The difference for the effect of orientation was only 3.21.

General Discussion
The purpose of our study was to understand if there is a link between preference for curvature (Silvia & Barona, 2009) and visual properties. At a visual level, curved contours could make processing easier compared to angular contours. Results revealed that the presence of curvature in the contour line affects efficient visual processing. We found that people were faster to detect intrinsic features of curved polygons compared to their angular version. This may contribute to the preference for curved objects. In addition to this, d’ data showed a trend toward higher sensitivity for curved polygons, which is consistent with the faster reaction times associated with curvature.

To extend our findings, we manipulated the contour line. Our hypothesis was that at a global level curvature showed the same advantage on angularity as snakes (collinear) on ladders (orthogonal) at a local level. We predicted that preference for curves would be maintained even when the manipulation of local configuration of the contour line is difficult to integrate.

According to approach-avoidance models and theories of affordance we would have expected to find an increase of threat perception in the condition where curved shapes present local angularity (Bar & Neta, 2006). Our results suggest an alternative explanation for the preference of curvature that is related to a specific propriety of the shape itself. We suggest that when the visual elements (global and local) of a shape are articulated in a harmonious way, i.e. the local items do not ‘break up’ or collide with the global curvature of the shape, then this is more appreciated visually.

In this vein one could also claim that curved shapes, as compared to angular ones, do not present elements (i.e. angles) that interrupt the flow of the visual processing, or create a departure from expectation. In contrast conflicting or divergent visual elements within a configuration could possibly account for unpleasant experience.

References
The Escher Illusion: An Interdisciplinary Analysis of Neuroaesthetics and the Information Theory

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Abstract
This study is to relate Maurits Cornelis Escher’s works to the channel capacity theorem of Claude Shannon and the art principles of Vilayanur Ramachandran. Escher is an insightful artist whose works contain his keen observation of the world and the expressions of his own fantasies. The electroencephalogram (EEG) experiment has detected the brain waves of our twelve participants when they viewed Escher's original works, Balcony(1945), Encounter(1944), Relativity(1953), and their modified ones. The results show that the features of Ramachandran’s peak shift effect can be epitomized to the notion of Shannon’s channel capacity theorem.

Keywords: Escher; Shannon’s Channel Capacity Theorem; Ramachandran’s Art Principles; Signal-to-Noise Ratio; Peak Shift Effect

Introduction
At the Copenhagen Neuroaesthetics Conference (24-26 September 2009), participants shared diverse opinions about their own researches and drew several meaningful conclusions. The summarized conclusions became more honest than existing fragmentary opinions. For example, there seems to be no clear hemispheric advantage for artistic or aesthetic activities. And our capacity to appreciate aesthetic and artistic phenomena emerges from the interaction between processes of perception, memory, decision-making, emotion and attention (Nadal and Pearce 2011). The context has inspired us to attempt new interdisciplinary approach to neuroaesthetics. We have found the clue from information theory. Considering that aesthetic responses to artworks emerge from interpretive process of appreciation as Arthur C. Danto said in "The transfiguration of the commonplace" (Danto 1981), the level of aesthetic responses can be related to information processing quantity of brain. Neurons in our brain are similar to network channels. The more effective information processing of neurons is, the more outstanding information delivery of neurons is (Borst and Theunissen 1999). Thus, aesthetic interpretive process might be directly explained by utilizing the channel capacity theorem of Claude E. Shannon.

Formula 1: Channel capacity theorem

\[ C = B \log_2 (1+S/N) \]

C: channel capacity, B: bandwidth, S/N: signal-to-noise ratio (SNR)

Channel capacity is the tightest upper bound on the rate of information that can be reliably transmitted over a communications channel. An increase of channel capacity follows from the increase of B(bandwidth) or the increase of S(signal) or the decrease of N(noise) (Shannon 1948). Considering that neurons are regarded as channels and networks, aesthetic experiences that occur in the brain might be closely tied to information processing.

Vilayanur S. Ramachandran is a pioneer who has tried to explain the relationship between the essence of art and our brain. He has proposed ten principles of art in a neuroesthetic point of view. It includes peak shift effect, grouping, isolation, contrast, symmetry, repetition, orderliness, metaphor, and so on (Ramachandran 2003). In his preceding paper, the principles seem to be concentrated in peak shift effect. It refers to the effect of proper exaggerations or minimizations which artists use in order to evoke a specific mood in the observers. As he explained, this leads to an interesting aphorism: 'All art is caricature' (Ramachandran 1999). At this point, we have found the excellent contact point of Ramachandran's peak shift effect and Shannon's channel capacity theorem. Exaggerations and minimizations used to highlight the essence of something are eventually equivalent to increasing signal and decreasing noise in order to expand channel capacity.

Thus, we explore the meanings and the relationships between Shannon's channel capacity theorem and Ramachandran's principles of art, experimenting on how exaggerations and minimizations used to amplify meaning of artwork can affect aesthetic appreciation. In the experiments, we utilized the works of Maurits Cornelis Escher. Veltman H. Kim mentioned in his paper that Escher's works contributed to the rebirth of perspective and the fragmentation of illusion in the 20th century (Veltman 1996). A lot of mathematicians have also admired his graphic art because of impossible constructions, explorations of infinity,
and complete tessellations. Observers could actually explore the illusion caused by exaggerations and minimizations when they view Escher’s works. It does not only mean that Escher’s works affect observers’ appreciation processes through the peak shift effect. It also means that his works can be approached through signal-to-noise ratio (SNR) of the channel capacity theorem.

Methods
Twelve subjects (6 men, 6 women) participated in the experiment. The average participant ages were 27.8 years. They had no history of other neurological or psychiatric conditions as well as visual disturbance. They also did not have advance information concerning Escher’s artworks. Enclosed room for experiment was width 2m, length 3m, height 2.5m and temperature 23-24 ℃, humidity 50-60%. 30 inch monitor was used to show subjects Escher’s original works and modified works.

Electroencephalogram (EEG) experiment was carried out through EEG equipment MP36 of Biopac Systems Inc. Positioning electrodes on the scalp was based on international 10/20 electrode system for electrode placement (Fig.1). We positioned electrodes at the four sites (Fp1, Fp2, T3, T4) on the ground of ear lobe (A1, A2). Prefrontal cortex Fp1 and Fp2 are the brain regions related to synthetic thinking. Meanwhile, temporal lobe T3 and T4 are the brain regions related to processing emotional contents (MacPherson and Phillips 2002).

![Figure 1: International 10-20 system for electrode placement](image)

**Balcony**(1945), **Encounter**(1944), and **Relativity**(1953) were Escher’s works shown to subjects. They are several things we can easily modify among Escher’s works mentioned in “Electronic media: the rebirth of perspective and the fragmentation of illusion” of Veltman and “Godel, Escher, Bach” of Hofstadter (Hofstadter 2000). In this paper, Escher’s original works are marked with B, E, R and modified works with B’, E’, R’ (Fig.2 & Fig.3). In the first modified work B’, the prominent illusion shape of building is removed and changed to the flat and normal shape. In the second modified work E’, the black men are changed to the white men. All colors of men in the work are unified into white color. In the third modified work R’, the relative directions of those who ascend or descend the stairs are unified into one-way direction.

![Figure 2: Escher’s original works B, E, R](image)

![Figure 3: Escher’s modified works B’, E’, R’](image)

All participants remained comfortable and relaxed state before EEG experiment. During experiment, Escher’s original work and modified work were presented alternately. In order to remove afterimages, subjects stared at an empty screen of green color for 30 seconds and remained still with their eyes closed for 30 seconds (Table 1).

<table>
<thead>
<tr>
<th>Step</th>
<th>Time(sec)</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30</td>
<td>Stare at an empty screen of green color</td>
</tr>
<tr>
<td>2</td>
<td>30</td>
<td>Remain still with their eyes closed</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
<td>View the modified work (B’, E’, R’)</td>
</tr>
<tr>
<td>4</td>
<td>30</td>
<td>Stare at an empty screen of green color</td>
</tr>
<tr>
<td>5</td>
<td>30</td>
<td>Remain still with their eyes closed</td>
</tr>
</tbody>
</table>
Acquisition of EEG data occurred at 200Hz sampling rate, 30Hz LPF (low pass filter), and 0.5Hz HPF (high pass filter). TC (time constant) was adjusted to 0.1. We focused on only alpha and beta rhythms because the meaningful interpretation of delta and theta rhythms is difficult. Power spectrums of alpha (8~13Hz) and beta (13~30Hz) were calculated through FFT (fast fourier transformation). In order to reduce data deviation of subjects and artworks, each raw data was normalized from data of relaxed state.

Formula 2: Normalized EEG

\[
\text{Normalized EEG} = \frac{\text{EEG of excited state} - \text{EEG of relaxed state}}{\text{EEG of relaxed state}}
\]

We compared EEG variations of Escher’s original works and modified works by utilizing normalized EEG. We also used beta-alpha ratio (beta/alpha) to analyze the awareness level of subjects. It is a ratio scale of brain wave activity.

On the other hand, we investigated the relationship between brain waves activity and information quantity by evaluating Escher’s works according to Ramachandran’s peak shift effect.

Results

The Results of EEG Recording

In general tendency of EEG changes, while alpha waves were activated in right temporal lobe (Fig.4), beta waves were activated in left and right frontal lobe (Fig.5). In beta-alpha ratio, Escher’s original works made most measuring sites activate. To be more specific, Relativity made beta/alpha power increase in left prefrontal cortex (Fig.8). Balcony, on the other hand, made beta/alpha power increase in right prefrontal cortex (Fig.6).
The Relationship Between Brain Waves and Information Quantity of Escher's Works

We applied peak shift effect to channel capacity theorem in order to compare information quantity between Escher's original works and modified works. The effect that increases central stimuli and decreases peripheral stimuli is analogous to increasing signals and decreasing noise to amplify channel capacity. Escher's original works potentially have more information quantity and lead to an increase of SNR by utilizing effectively peak shift effect (Table 2).

Table 2: Comparison of information quantity between Escher's original works and modified works

<table>
<thead>
<tr>
<th>Information quantity</th>
<th>Information theoretic interpretation concerning Escher's original work</th>
<th>Interpretation related to peak shift effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>B’ &lt; B</td>
<td>S↑ N↓ SNR↑</td>
<td>central stimulus↑ peripheral stimulus↓, (amplification of center, minimization of surroundings)</td>
</tr>
<tr>
<td>E’ &lt; E</td>
<td>S↑ SNR↑</td>
<td>central stimulus↑ (contrasting colors of main characters)</td>
</tr>
<tr>
<td>R’ &lt; R</td>
<td>S↑ N↑ SNR↑</td>
<td>central stimulus↑ peripheral stimulus↑, (extension of main materials and transcendent connection, discursive configuration)</td>
</tr>
</tbody>
</table>

In Escher’s original work *Balcony*, an increase of central stimuli and a decrease of peripheral stimuli follow from amplification of center and minimization of surroundings. It affects an increase of signals and a decrease of noise. It totally leads to an increase of SNR and information quantity. In Escher’s original work *Encounter*, an increase of central stimuli caused by contrasting colors of main characters also affects an increase of SNR and information quantity. On the other hand, in Escher’s original work *Relativity*, while extension of main materials and transcendent connection make central stimuli increase, discursive configuration of materials makes peripheral stimuli increase. Although it means increases of both signals and noise, the increase of signals is bigger than the increase of noise. It eventually leads to an increase of SNR and information quantity.

The information theoretic interpretation related to Escher's original works and peak shift effect can be connected to the results of our EEG recording. In beta-alpha ratio, the reason why Escher's original works made beta/alpha power increase is inseparable from invisible information quantity.

Discussion

We need to remind Shannon's channel capacity theorem again. Considering that the formula is connected to information processing of brain, an increase of bandwidth($B$) corresponds to extension of dendrite branches and axon thickness by changes in neural pathways and synapses like neuroplasticity. If it is rephrased in a neuroaesthetic point of view, it means that interpretive process concerning artworks is dependent on the audience level of information possession and information processing. On the other hand, an increase of signal($S$) or a decrease of noise($N$) corresponds to an increase of sensory signals or a decrease of sensory noise derived from a certain object. In a neuroaesthetic point of view, it is dependent on the brain response caused by shape features of artworks. In this paper, we have focused on signal-to-noise ratio(SNR) caused by shape features of artworks rather than bandwidth($B$) related to audience level of information processing. It is considered as a prerequisite for more complex researches. Thus, in order to establish the relationship between aesthetic response and information quantity derived from shape features of artworks, we carried out EEG experiment which show participants Escher's original works and modified works alternately. In the results of EEG recording, Escher's original works triggered higher brain waves activities in most measuring sites than modified works. Left and right prefrontal cortex, in particular, showed outstanding brain waves activity. It means that subjects processed more amount of information and thought more synthetically when they viewed Escher's original works. Additionally, we can...
infer that Escher knew intuitively peak shift effect and utilized it quite freely. Illusion in Escher's works might be derived from an increase of information quantity and brain activation caused by peak shift effect (Fig.9).

![Peak Shift Effect Diagram]

Figure 9: The source of Escher illusion

However, our experimental results did not include specifically audience level differences of information processing. Our experiment was only carried out around signal-to-noise ratio(SNR) caused by shape features of artworks. It means that we need to implement the experiment related to an increase of bandwidth(B) in Shannon's channel capacity theorem. Thus, in the next research, we will design experiments around bandwidth(B) related to audience level of information processing. The advanced results will be a great help to establish the relationship between art and nervous system as well as between neuroaesthetics and information theory.

References

Personal Connoisseurship: A Research Agenda

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Abstract
Using aesthetic interaction models recently developed as a springboard, Smith (2014) has developed the notion of “the museum effect” which examines how the interaction of individuals with works of art leads people to think about issues related to their lives, their interactions with others, and how they view society. The Museum Effect essentially takes the perspective of how museums affect individuals. Turning this around to the individual as the unit of analysis, the concept of “personal connoisseurship” is presented. Personal connoisseurship is defined as the ability of the individual to effectively and meaningfully bring their constellation of personal history, aesthetic fluency, and dispositions to their interactions with works of art.

Keywords: connoisseurship, aesthetics, museum effect

Background
A person’s interaction with a work of art depends upon the work of art, the person, and the context in which the work is presented. This can be seen in the models of aesthetic interaction proposed in recent years by Locher, Overbeeke, and Wensveen (2010); Leder, Belke, Oeberst, and Augustin (2004); Chatterjee (2004); Tinio (2013); and Smith (2014). Each of these models attempts to help us understand how we look at, and ultimately appreciate art.

The models fundamentally posit that there is an interaction space that resides somewhere between the work and the person, and in that space, the individual reaches (to a greater or lesser degree) an understanding of the work that is meaningful to the individual. Because of the differences individuals bring to their interactions with works of art, the nature of the aesthetic experience will differ from individual to individual, as well as from one work to the next for a given individual.

Personal Connoisseurship
Some people seem to have a more developed ability to appreciate and enjoy works of art than others. Some individuals become dismayed over what they perceive to be an inability to really “get” works of art, while others revel in them. The ability to find success in one’s aesthetic interactions might be called “personnel connoisseurship.” It is the ability to find personal meaningfulness, depth, even joy in one’s interactions with aesthetic objects.

The argument presented in this paper is that personal connoisseurship is a useful conceptualization of the ability and disposition of an individual to find personal meaning in artistic objects. The object could be a work of art, a glass of wine, a musical performance, etc. It differs from the normal use of the term connoisseurship in that it is particular to individuals. Typically, a connoisseur is thought of as someone with a particularly sharp sense of art, an ability to see quality almost instinctively, to be able to evaluate works of art (or of other areas of art, and even gastronomy). A connoisseur is someone that an ordinary person would go to for an informed opinion on a work of art.

That being the case, what would the notion of personal connoisseurship entail? Indeed, are the two words of the phrase oxymoronic in their relationship. Does the phrase mean anything more than, “I don’t know much about art, but I know what I like”? Well, hopefully it does. It has to begin with first purposes regarding art. What is it for? Is it solely the domain of the highly trained, or does art exist for a more general population? And if it does exist for a more general population, can ordinary individuals differ in the degree to which they are able to make art meaningful to themselves? Can such an ability be enhanced through education and interactions with works of art at museums and other cultural institutions?

Take, for example, an individual who looks at a given work of art and sees nothing of particular interest in it, while another, with the same initial reaction, decides to give the work a few more seconds. And in that time the individual sees an expression that reminds her of a favored aunt, or a stream that brings up a sense of freedom in being outdoors. The individual lets those feelings run, and begins to see more in the work, and in her reaction to the work. This individual has the disposition to invest more effort, and perhaps creativity, into her interaction with the work of art, and in doing so, “gets more out of it.” This person may not know more about that work, or art in general, than the person who moved on after a quick look. The difference is in how the person approaches the work, what she is willing to put into it, and what her expectations are for it. There are real differences between the two individuals, and they relate to how the work is appreciated, but those differences do not have to do with knowledge or expertise about the work, or art in general. They have to do with differences in a connoisseurship that is more personal to the individual.

Personal connoisseurship would require a disposition to find meaning in works of art; a willingness to explore one’s feelings, thoughts, and emotions while looking at works of art; an eye toward finding in works what is important,
striking, or moving to the individual; and a knowledge of oneself and to an ever increasing degree, the objects that one encounters.

Those are the issues that a research agenda on personal connoisseurship needs to address.

A Research Agenda

If we define personal connoisseurship as the constellation of dispositions, self-knowledge, and art background and experience that combine to allow individuals to have highly meaningful interactions with works of art, where does that lead us in terms of investigating the concept?

To begin, a research agenda needs to work on the definition of the concept itself. Although the phrases proffered in the previous paragraph seem pertinent, and even appealing in some fashion, what do they mean? Which of them are essential to this notion and which are peripheral? Does such an idea of personal connoisseurship even exist, or is it a whim? So to begin, it will be necessary to focus on the notion of a definition, and then to very basic studies that determine whether people really differ in this. It really puts forward the question: Do people differ in their ability to appreciate art?

Following studies that look at that question, the next issues are what are the components of such appreciation? Can we bring these ideas toward more fundamental notions of human beings that we can understand as psychologists? Are people who appreciate art more, generally more open to experience? Are they necessarily more knowledgeable about art (and if they are, what is the directionality of such a relationship)? Does more knowledge about art lead to greater appreciation, or does greater appreciation lead to a desire to view art more frequently?

A research agenda for personal connoisseurship would also have to include an exploration of the nature of the activity of appreciating art. What happens? What parts of the brain light up under such activities? How would individuals express what they are feeling? Are there ways to investigate such appreciation in unobtrusive fashions? What literature already exists that would help us in engaging in such research?

As with any research, what we find will guide where we go next.

References

Gender Differences in Perceptions of Facial Beauty

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Abstract
In order to understand the effects of both rater and stimulus gender on standards of beauty, we explored aesthetic judgment and reward valuation for male and female faces and measured the degree to which heterosexual participants of both genders found the same faces to be attractive or rewarding. The results suggest that while neither participant nor stimulus gender has an effect on ratings of attractiveness, both show an effect on value judgments. Stimulus and participant gender were also shown to have an effect on across observer agreement for both aesthetic and value judgments.

Keywords: Faces; attractiveness; beauty; gender differences; agreement.

Introduction
Perception of faces has long been an area of interest in psychology and related fields. Facial beauty in particular has garnered much attention, partially due to its strong motivational aspects. Previous studies have shown high correlations between beauty and success in the workplace (Hamermesh and Biddle, 1994), and beauty and perceived intelligence (Landy and Sigall, 1974). Evolutionary theorists have proposed that facial beauty is a signal of mate quality (Rhodes, 2006).

Other research on facial beauty has focused on the private versus shared components of beauty. Studies directly investigating agreement across observers report relatively high pairwise cross-observer agreement (r = 0.5) in attractiveness judgments for faces (Bronstad & Russell, 2007; Hönekopp, 2006); this reveals that although there is some individual preference involved in facial beauty, there is a strong shared component in evaluating facial attractiveness.

Despite advances in our understanding of how people evaluate facial attractiveness, the role that gender plays in determining the degree of shared versus private taste in beauty remains a question of debate. Marcus et al. (2003) reported that participant and stimulus gender have an effect on agreement: male participants had higher agreement when rating female faces as opposed to male, while female participants showed similar levels of agreement regardless of stimulus gender. Alternatively, Hönekopp (2006) reported that differences in gender of stimuli and participant show no significant effect on agreement. Although they did not directly measure agreement across participants, a study of how stimulus gender affects judgments of beauty and reward processing would seem to provide support that aesthetic preferences are not affected by stimulus gender: Aharon et al. (2001) examined heterosexual men’s aesthetic preferences and value judgments of male and female faces of different levels of attractiveness (average faces vs. “models”). They found a dissociation between these two types of evaluative processes: gender had no effect on the participants’ average attractiveness ratings, but did affect their value judgments for the model faces, such that while male models were rated as equally attractive to female models, the observers would exert effort to reduce viewing times for male model faces while working to increase viewing times for female model faces. Despite the fact that Aharon et al. (2001) only tested heterosexual male subjects, this result suggests that stimulus gender may influence reward value, but not aesthetic judgments of attractiveness.

In order to clarify the role of stimulus and rater gender in determining private versus shared components of attractiveness, we adopted the Aharon et al. (2001) paradigm to collect aesthetic ratings and reward judgments of both male and female (heterosexual) participants looking at average and “model” faces – but in addition to examining average preferences, a measure of across-observer agreement was also computed for each of the four stimulus categories. This allowed us to address two key questions: 1) is the dissociation between ratings of attractiveness and reward value seen for heterosexual male viewers also present for heterosexual females, and 2) is there an effect of stimulus or rater gender on the degree to which different people similarly evaluate facial attractiveness?

Methods
Participants
17 heterosexual male (15 right-handed; mean age = 26.2 ± 8.0) and 16 female observers (13 right-handed; mean age = 22.75 ± 3.5 years) participated in the experiment (two subjects were removed due to low reliability scores). All
participants gave their written consent and were remunerated for their time.

Stimuli
The stimuli used were identical to those used in Aharon et al. (2001): 80 non-famous faces were selected from four categories, with 20 faces in each category: female average, female beautiful, male average and male beautiful. Beautiful faces were selected from print media. The faces were digitized at 600 dpi in 8-bit grayscale and cropped in an oval (310-350 pix wide x 470 pix high) closely around the face.

The stimulus set was modified by equalizing the C_{RMS} contrast of each stimulus, and placed on a background in a uniform gray (44.2 cd/m^2). Stimuli were presented on a ViewSonic ViewPanel VE170 monitor using MATLAB R2011b 32 bit and the Psychophysics Toolbox (Brainard, 1997). The images subtended 8° of visual angle in height. Two stimuli were replaced due to one stimulus being mislabeled and one being a celebrity.

Procedure
Each observer participated in two separate tasks, a “rating task” and a “keypress task,” given in succession. The order of the tasks was counterbalanced between observers, and pairs of observers viewed the stimuli in reverse order. Prior to beginning the first task, each participant was asked to fill out a background questionnaire, which collected demographic information as well as a brief history of their aesthetic training. Participants also completed two mood surveys, the State-Trait Anxiety Inventory (STAI), and the Temporal Experience of Pleasure Scale (TEPS). The STAI measures anxiety towards events, as well as anxiety as a personal trait. The TEPS measures how a participant experiences pleasure, both the pleasure of looking forward to an experience and the experience itself. Each task was preceded by an instruction period (see below), during which instructions were presented visually on the screen, and the observer was given a series of at least 4 practice trials.

Task Design
Rating Task This task measured participant’s aesthetic judgments of faces. The 80 faces were presented in random order to each observer on each trial. A fixation point (500 ms) would appear on the screen to prompt the observer, followed by a face presented for 3 seconds (Fig. 1A). After the stimulus disappeared, the observer was prompted by an instruction on the screen to answer the question: “How attractive do you find this face?” Participants rated the face’s attractiveness on a scale from 1 to 7, 1 being very unattractive and 7 being very attractive. There was an intertrial wait time of 1 second. During the task, the experimenter left the room.

Keypress Task The 80 faces were blocked by gender for this task and presented as follows: each face would appear on the screen; if left alone, each face would remain on screen for a default time of 4 seconds (Fig. 1B). However, observers were instructed that they could increase or decrease the presentation duration of each image. To reduce the presentation duration, they did so by alternating pressing two keys labeled with a minus sign (“-”). If they wished a face to remain on screen longer, they did so by alternating pressing to keys labeled with a plus sign (“+”). Each pair of keypresses changed the viewing time by the following formula:

NewTotalTime = OldTotalTime + (ExtremeTime – OldTotalTime)/K,

where Extreme Time for reducing the viewing time = 0 s, Extreme Time for increasing viewing time = 8 s, and the scaling constant K was equal to 20. These values were changed from the Aharon et al. (2001) values based on pilot data and the average viewing time reported in that experiment. Observers were informed that the total task time and payment were independent of their choices during the task. However, the time was actually based on a fixed number of trials.

Instructions
Rating Task Imagine that you are asked to help compile a “time capsule” that will be preserved for future generations. In it will be placed images to show the people of the future what attractive members of the human race looked like in our time. The creators of the capsule need to know how attractive each face is, based on how strongly you as an individual respond to them. Your job is to give your gut level response, based on how aesthetically attractive you find each face.

Keypress Task Imagine that the images you see are people featured in a magazine. As a reader of the magazine, you choose to look at some of the faces for a long time. On the other hand, there are some faces that you may not choose to spend much time looking at.

In this experiment, you will control how long you spend looking at each image, much like you would if you were looking through a magazine.
Results

To investigate whether male and female observers show dissociations between beauty judgments and reward responding, the average attractiveness ratings and viewing times of both male and female observers looking at both male and female faces were computed (Fig. 1).

An examination of men’s mean preference ratings found a dissociation between attractiveness ratings and viewing times, replicating Aharon et al., (2001; Fig. 2A, B). A 2-way ANOVA of the rating responses (gender x stimulus category, with subjects entered as a random effect) revealed a significant preference for models over average faces \((F(1,15) = 81.11, p < 0.01)\) but no effect of stimulus gender \((F(1,15) = 3.02, p = 0.1)\) and no interaction \((F(1,15) = 0.04, p = 0.85)\). A 2-way ANOVA of viewing times in the keypress task revealed there were significant effects of stimulus gender \((F(1,16) = 9.3, p < 0.002)\) and attractiveness \((F(1,16) = 28.96 p < 0.0001)\) as well as a significant interaction \((F(1,16) = 11.84, p < 0.005)\) – heterosexual men chose not to spend time looking at the male models in the keypress task (Fig. 2A, B).

In contrast, neither female participants’ ratings of attractiveness nor viewing times were modulated by stimulus gender. A 2-way ANOVA of the rating responses (gender x stimulus category, with subjects entered as a random effect) again revealed a significant preference for models over average faces \((F(1,15) = 165.59, p < 0.001)\) but no effect of stimulus gender \((F(1,15) = 0.01, p = 0.92)\) and no interaction \((F(1,15) = 0.13, p = 0.72)\). A 2-way ANOVA of viewing times in the keypress task revealed there was a significant effect of attractiveness \((F(1,15) = 42.07, p < 0.001)\) and a significant interaction \((F(1,15) = 5.75, p < 0.05)\), but no effect of stimulus gender \((F(1,15) = 0.36, p < 0.56; \text{fig. 2C, D})\).

In order to test whether the degree of agreement across individuals for responses to faces is modulated by either stimulus or rater gender, a measure of across-observer agreement was computed for male observers looking at each of the four categories of stimuli, and separately, for female observers looking at each stimulus category. To calculate agreement, a ‘mean-minus-one’ correlation was used: each individual participant’s aesthetic ratings and viewing times were correlated with the mean aesthetic ratings and viewing times of all other participants. This measure of agreement was computed for both the aesthetic rating data and for the viewing times in the keypress experiment.

When rating facial attractiveness, male observers agree more on which female models are attractive \((r \text{ for FA} = 0.52; r \text{ for FB} = 0.63)\) than on which male models are attractive \((r \text{ for MA} = 0.49; r \text{ for MB} = 0.39; \text{Fig. 3A})\). A 2-way ANOVA...
of the agreement data for the male rating task shows a main effect of gender ($F(1,16) = 7.17, p = 0.016$), no effect of attractiveness ($F(1,16) = 0.38, p = 0.55$), and a significant interaction ($F(1,16) = 12.54, p = 0.0027$).

Similarly, male observers also agree more on which female faces they choose to spend time looking at ($r$ for FA = 0.40; $r$ for FB = 0.56) than on which male faces they choose to spend time looking at ($r$ for MA = 0.21; $r$ for MB = 0.614). A 2-way ANOVA of the viewing times in the keypress task shows a similar pattern of results to those in the rating task: male subjects show a main effect of gender ($F(1,16) = 32.98, p < 1x10^{-5}$) and a significant interaction ($F(1,16) = 5.93, p = 0.03$), with no effect of attractiveness ($F(1,16) = 2.56, p = 0.13$; fig. 3B).

Female observers, on the other hand, do not show higher agreement for attractiveness ($r$ for FA = 0.46; $r$ for FB = 0.56), nor longer looking times ($r$ for FA = 0.33; $r$ for FB = 0.42) for female faces, and in fact show a trend in the opposite direction (rating: $r$ for MA = 0.57; $r$ for MB = 0.53, keypress: $r$ for MA = 0.51; $r$ for MB = 0.39). A 2-way ANOVA of the agreement data for the female rating task shows no effect of gender ($F(1,15) = 2, p = 0.18$), and no effect of attractiveness ($F(1,15) = 0.12, p = 0.73$). The data shows only a trend towards an interaction ($F(1,15) = 3.09, p = 0.1$), with higher agreement on average males than average females (figure 3C). The female keypress task data shows a similar pattern: a 2-way ANOVA of the agreement data for the female keypress task shows no effect of gender ($F(1,15) = 1.63, p = 0.22$), and no effect of attractiveness ($F(1,15) = 0.23, p = 0.64$) but does show a trend towards an interaction ($F(1,15) = 0.9, p = 0.07$; fig. 3D).

**Figure 3:** Responses to opposite-gendered faces, as opposed to same-gendered faces, show higher agreement across individuals for both attractiveness ratings and value judgments. A) Male rating task agreement, showing higher agreement on beautiful female faces than beautiful male faces (effect of gender $p=0.016$, interaction $p=0.0027$); B) Male keypress task agreement shows higher agreement when males view female rather than male faces (effect of gender $p<1x10^{-5}$, interaction $p=0.03$); C) Female participant rating agreement showing a trend towards an interaction ($p=0.1$); D) Female keypress agreement showing a trend towards an interaction ($p=0.07$)

**Discussion**

**Beauty versus Reward Value**

In a replication of Aharon et al. (2001), we found that heterosexual male participants’ ratings of aesthetic preference (e.g. “beauty” or attractiveness) were not affected by the gender of the stimuli, whereas the degree to which heterosexual men attribute value to faces (as measured by their willingness to work to prolong or shorten viewing times) is affected by gender – men rate male models as being equally attractive to female models, but will work to shorten viewing times to male models compared to female models.

Aharon et al. (2001) claim that this finding supports a theoretical separation between assessments of aesthetic beauty and of reward valuation that may mirror the dissociation between “liking” (immediate consummatory response to attainment of a reward) and “wanting” (approach motivation or incentive salience associated with seeking out a reward, e.g. “craving”) observed in the animal literature (Berridge & Kringleba, 2013). Indeed this task has been used in clinical populations to test for selective deficits in reward responding (Elman et al., 2005; Heerey & Gold, 2007).

However, this dissociation does not appear to hold for heterosexual female observers. For female participants, gender had no effect on either attractiveness ratings nor time spent viewing stimuli. Clearly, both rater and stimulus gender contribute differently to separate processes of evaluation; heterosexual women’s assignment of reward value to faces is not modulated by gender, while heterosexual male’s assignments of value are. This could be a reflection of men and women’s use of different criteria to assess the incentive salience of faces. Additionally, these results call into question the clinical validity of this task for assessing the constructs of “liking” and “wanting,” as it appears as if faces may only differentially engage these two systems for a subset of the population in a manner that is unrelated to clinical symptoms (e.g. heterosexual males).

**More Similar Tastes for Oppositely Gendered Faces**

The degree to which different observer’s find the same faces attractive or rewarding depends on the gender of both the rater and the stimulus; in general, people tend to agree more on which faces of the opposite gender are more attractive and rewarding. For the male observers, this effect was primarily seen as higher agreement for the female “model” faces compared to male model faces, whereas for female observers, the effect was primarily seen as higher agreement for “average” male faces compared to “average” female faces. One possibility, supported by the statistics, is that there is a general main effect of stimulus gender on agreement, plus an
interaction such that agreement tends to be higher for female
t Models than for male models, but for average-looking males
more so than average-looking females.
Qualitatively, these results are similar the findings of
Marcus et al. (2003), who reported higher agreement when
males made judgments about female attractiveness than
either females judging males or either gender judging the
same gender. Importantly, our results extend these findings
from real-world interactions with real people to images of
unfamiliar individuals, and also reveal that the agreement for
male and female faces may differ depending on whether one
is assessing models or average-looking individuals.

The strong effects of gender on male participants levels of
agreement and the lack of effect of gender on the female
participants agreement suggest that heterosexual men use
more similar features when evaluating female beauty than
when evaluating male beauty and that this is not a property of
female faces per se, as female viewers do not show this
effect. Although the results for females are weaker, the trend
for women to show higher agreement for male faces suggests
that evaluations of opposite gender faces (for heterosexual
individuals) rely on a set of features that is highly conserved
across individuals, but that evaluations of same gender faces
rely on a more idiosyncratic set of features. Interestingly,
these findings appear in both the attractiveness ratings and
the viewing time measurements, suggesting that the set of
features that are used for evaluating oppositely gendered
faces are more highly conserved across individuals for
attractiveness judgments and for the amount of approach
motivation associated with a face.

This study highlights the complex role that gender plays in
perceptions and emotional and behavioral responses to faces.
Both the analysis of mean preferences and the analysis of
agreement across individuals reveal significant effects of
gender on how people interact with and make judgments
about human faces. Not only are there salient differences
between how men and women respond to faces, but even
within each gender the mechanisms for how people evaluate
faces depends on the gender of the face being viewed. In
particular, these results suggest that the evaluation of
oppositely gendered faces by heterosexual individuals may
rely on a set of features that is largely conserved across
people, whereas evaluation of same gendered faces reflect
more individual tastes. In addition, the reported dissociation
between evaluations of beauty and reward value for
heterosexual men looking at beautiful male faces appears to
be specific to that situation, as no such differences are found
for female subjects.

Acknowledgments
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Exploring the Mechanism of the Aesthetic-Usability Effect

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Abstract
The aesthetic-usability effect is a phenomenon whereby people perceive more aesthetically pleasing designs as easier to use than less aesthetically pleasing ones, regardless of whether they are actually so. Fluency is defined as the subjective experience of ease associated with completing a mental task. It is a factor that influences a wide array of judgments including aesthetic appeal, and it may also affect the judgment of usability. We investigated the connection between fluency and the aesthetic-usability effect. The result showed that fluency has a direct effect on usability, and its effect on usability was mediated by aesthetics. Therefore, our study suggests that fluency cannot be ignored while explaining the aesthetic-usability effect.

Keywords: fluency; usability; Website

Introduction
The aesthetic-usability effect involves people perceiving more aesthetically pleasing designs as easier to use than less aesthetically pleasing ones, regardless of whether they are (e.g., Kurosu & Kashimura, 1995; Lidwell, Holden, & Butler, 2010). However, previous research could not adequately explain the cause of the aesthetic-usability effect. The causal relationship between the aesthetic appeal of a design and its usability was uncertain because former research merely confirmed a simple correlation between the aesthetic features and usability. Thus, we focused on fluency as a key to revealing the mechanism of the aesthetic-usability effect.

Fluency is defined as the subjective experience of the ease associated with completing a mental task (Oppenheimer, 2008). It influences a wide array of judgments, including aesthetic appeal, and may also affect the judgment of usability. A higher fluency leads to judgments that are more positive. Fluency determines the aesthetics of simple visual stimuli (e.g., rectangle, text, line drawing; Reber, Schwarz, & Winkielman, 2004), and can be easily changed by modifying aspects of the design (e.g., contrast, symmetry, priming).

Websites are often used as stimuli in researches about aesthetic-usability effect (Hassenzahl & Monk, 2010; Tuch, Roth, Hornbæk, Opwis & Bargas-Avila, 2012). Aesthetics of Websites are divided two dimensions (Hassenzahl, 2004; Lavie & Tractinsky, 2004). Lavie & Tractinsky (2004) named them classical aesthetics and expressive aesthetics. The classical aesthetics emphasize orderly and clear design and are closely related to many of the design rules advocated by usability experts. On the other hand, the expressive aesthetics is manifested by the designers’ creativity and originality and by the ability to break design conventions.

Methods
The purpose of the experiment was to investigate the relationship between fluency, aesthetics and usability. In addition, we examined whether effect of fluency varied depending on the type of aesthetics.

Participants
We recruited 91 Japanese undergraduate students (males: 36, females: 55; Mean age: 18.9 years). They were offered course credit for taking part in the experiment.

Design
Four levels of contrast were used within the design (100%, 70%, 40%, and 10%). The contrast was a one of the manipulation of fluency. The higher contrast was, more fluently our information processes were.

Materials
Eight website screenshots were used as stimuli, and their designs were varied to influence fluency (Figure 1).

Figure 1: Example of Stimuli
Figure 2: Correlation between aesthetics and usability.

The tool to measure perceived website aesthetics and usability, developed by Lavie & Tractinsky (2004), was translated into Japanese. This tool contains classical aesthetics (5 items: clean, clear, pleasant, symmetrical, and aesthetic), expressive aesthetics (5 items: original, sophisticated, fascinating, creative, and uses special effects), and usability (4 items: convenient, easy orientation, easy to use, and easy to navigate).

Procedure
The participants were shown eight websites and were asked to rate each website on a scale of 1 to 7 regarding how beautiful it was, and how usable it appeared to be. The experiment was carried out self-paced. All responses were collected on Qualtrics which enables users to do online data collection and analysis.

Results
Participants who were not Japanese speaker, who skipped questions, who showed yes-tendency, or who could not see
some of stimuli were excluded from data analysis. This exclusion left 77 participants for data analysis.

We conducted correlation analysis between aesthetics and usability for 32 stimuli (Figure 2). As a result, we observed the positive correlation between aesthetics and usability. The aesthetics is average of the classic aesthetics and the expressive aesthetics. This result indicated that the aesthetic-usability effect occurred in our experiment.

We conducted multilevel mediation analysis (Figure 3). The results revealed that fluency had a direct impact on usability. The results also showed that the effect of fluency on usability was mediated by the aesthetics of the design.

Moreover, fluency had a larger influence on classical aesthetics than on expressive aesthetics. Further, the impact of classical aesthetics on usability was larger than that of expressive aesthetics. Therefore, it was observed that the impact of fluency on usability was mediated by classic aesthetics. These results indicate that two dimensions of the aesthetics of the websites were distinguished whether they were determined by the fluency or not.

**Discussion**

As a first step of revealing mechanism of aesthetic-usability effect, we investigated the relationship between fluency, aesthetics and usability. Websites were used as stimuli. Fluency was manipulated by contrast. As the results, the aesthetic-usability effect occurred in our experiment. Furthermore, fluency directly influenced usability. The higher the fluency was, more positive the judgements of usability were. This is the first inquiry that showed fluency made an effect on usability.

Both classical aesthetics and expressive aesthetics had an impact on usability. However, only classical aesthetics mediated the effect between fluency and usability. The expressive aesthetics was not such a mediator. Thus, these two aesthetics may have different quality in terms of the extent of depending on fluency.

Websites are composed of rectangles, rectangles, and lines. Additionally, the classic aesthetics influenced usability stronger than the expressive aesthetics did. Therefore, the aesthetics that elicited from fluency had a larger effect on usability than the aesthetics that were not depending on fluency.

Our study suggests that fluency cannot be ignored while explaining the aesthetic-usability effect. This can explain how the actual use of websites cause and negate the aesthetic-usability effect. Fluency is generated from various sources; therefore, the assessment of usability after using the website can depend on the fluency generated from the appearance of the websites, as well as on that generated by the actual use of the website. Thus, the findings of our study may help website users and designers.

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Meeting Between Cultures in the Vision of Two of Kurosawa’s Short Films

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Abstract

Aim—Cinema is an art located in a space in which narration, music and photography coalesce and which creates an evocative space which accompany the user in a process of co-creativity by means of intra-subjective cognitive-emotional elaboration of the narration. The inquiry has an exploratory study goal about the perception and re-elaboration of young Italians that approach Japanese cinematography. Method—The proposed study analyses the impressions and the memories of 461 university students (last year of Psychology) who assisted the projection of the first two ‘Kurosawa’s Dreams’ which distinguish for being among the most oneiric films from this director. Both films are imbued of Japanese culture which augments the magic of the telling of the two films’ endings. After the vision the students have been asked to write a brief text about what they had just seen. The texts have been analyzed by means of the SPAD software, useful in qualitative and quantitative researches on textual data. The article analyzes the dictionary composition, the specificity of the dictionary according to the variables ‘film’ and ‘gender’ and then proceeds with the factorial analysis. The results suggest the narrative representations and the specific emotional and cognitive meaning dimensions with which Italian youths re-elaborate experience with art. A fruition scheme is thus noticeable, which identifies the interpretative matrix in the structuralization of the aesthetic perception criteria.

Keywords: narrative representations; emotional meaning; cognitive meaning, Kurosawa’s dreams.

Premise

From the perspective of their technology, the films may be viewed as “memory devices”, because, just like the memories, they are formed by a phase of storage, which means recording, and a phase of reworking, which takes place with the projection. Furthermore, the language of sounds and images has an immediate effect upon the emotions (Pesce, 2007, p. 436). The functionality of the cinema is given by its power of illusionism. What matters is not the trustworthiness of the source (as it happens in the case of documents) but the reality effect. Following this idea, one may distinguish living memory from cultural memory: the former is linked to the physical and psychical experiences of the person remembering, while the latter one is artificial (Assmann, 1999; Pesce, 2007).

Our work is based on two short films, each one of 10 minutes, extracted from the film Kurosawa’s Dream by Akira Kurosawa, the Japanese master who considered himself to be extremely demanding in his work, just as a good craftsman. “With the films Dreams, August Rhapsody and Madadayo I

have tried to speak to the people’s heart in an indirect manner: the respect for the others and for the nature, the tenderness, the mutual understanding, the gratitude, the friendship, the humanity, in sum, are the most important thing in a person’s life. If I have succeeded in communicating these feelings, then I’m happy” (1993, p. 6).

The film Kurosawa’s Dreams is dated 1990. The author alludes to Dostojevski, who claimed that the dreams are the visible expression of our wishes and of our anxieties, buried in the depth of our own beings. In this film the director refers to the dream as an original mode of expression. “The dreams translate wishes and fears in a fantastic manner, in an entirely free form: when one dreams, one is brave and bold like a genius. In my film I have tried to accept the challenge of the dreams I had seen (...) To the oneiric starting points I have added, of course, one part of invention” (Tassoni, 1993, pp. 116-117). The two opening dreams (Sunshine Through The Rain and The Peach Orchard) are the most mysterious, the most magically beautiful. In the first one, we see a five-years old boy going alone in the woods (disobeying his mother’s orders) to watch the marriage of the foxes to which nobody should be present. Behind some gigantic cedars, the little boy is stunned by the image of the procession of foxes, dressed in shining clothes, going forward and dancing on an ancient Japanese music. The boy is happy, but he is found out and runs back home where he finds his mother waiting for him: the foxes had warned her and had given her a dagger, with which the boy should kill himself. Only in this way he will be forgiven for having witnessed what he should have never seen. In order to save his life he has to apologize to the foxes. The boy asks his mother, who is about to go back into the house, where the foxes’ house lies: it can be found at the feet of the rainbow which always appears after a rain. The film ends with the boy crossing a flowery meadow and going towards the feet of the rainbow accompanied by a Western music which is in contrast with the music throughout the other film parts.\(^{23}\)

The second short movie is The Peach Orchard which begins on the day of the feast of the dolls which is also the feast of the peach trees. The sisters of the protagonist (a ten years old boy) are in a room in front of the shrine in which there are a lot of dolls, reproducing the structure of the imperial family. The boy sees a girl whom nobody else can see and who leads him to a hill where the spirits of the cut-

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\(^{23}\) Shinichirō Ikebe has created the soundtrack.
down peach trees appear. The spirit of the emperor accuses the boy of this slaughter. The crying boy proves his innocence and, as a reward, the spirits dance and make the Peach Orchard appear in bloom. A cloud of petals of peach flowers falls through the air.

The dance of the foxes and of the peach-trees spirits are considered scenes of the highly skilled cinematographic art. There are not many reasearch works of this kind, hence it is difficult to refer to the literature on the topic. A parallel may be made to the experiment made by Pozzato (1995) who has shown seven minutes extracted from the film “Try again, Sam” by Woody Allen to the students and asked them to describe that which they had seen. According to Pozzato, the students’ narrations show concretely and simultaneously both the multiplicity of the possible stories and the norms outside which such stories become inefficient.

Here we can also quote the study by Gregorio (2011), regarding representations of the family in the cinema. It should be taken into account, however, that the family belongs to the complex of social representations referring to value systems, ideas and practices which are able to establish an order that allows individuals to understand and master their own material and social world and to communicate among them due to the creation of codes and of conventions building a shared heritage (Moscovici, 1984). Only in part do dreams belong to the social representations and, in any case, the state of “dream” itself invites us to search for a common inheritance.

It is important to remember that cinema, like all dramatic arts, allows catharsis and has the effect of blocking and allowing a substitutive path for our emotions (Jarvie, 1970).

Aims and Method

In the contemporary socio-cultural context, when the doublet psychology – film is brought into discussion, the evoked image is that of a technique or an expedient of a psychoterapeutical sort. Still, being able to see a film, a TV series or a cartoon seems to be a common, daily experience in developed societies. Psychology and sociology provide the tools not only for encouraging change in the individual as well as in groups, but also for understanding the processes of interpretation and recollection which are suggested by the cinematographic industry to the society. The present study represents an explorative inquiry on the social relevance of the cinema and it is focused on the identification of narrative matrices that guide the elaboration and recollection through images, lights, and sounds, in the individual as well as in groups.

In order to make this inquiry, we have involved 461 students in the last year of their B.A. programme in Psychology. Although all students were Italians, they were from different regions, representing the northern, central and southern areas of Italy. The work team appreciated that, although this sample of young people could lack maturity and the technical competence in the observation given by their own academic curricula, they could be able to give relevant answers for this research, as this experience is completely new to them in comparison to their academic preparation. In Italy and particularly in the selected faculty, film projections are not employed during the lessons. Finally, it should be noted that the films chosen as a research topic are not well-known creations, because they were made in 1990 and they are rarely broadcasted by the Italian channels. The episodes extracted from Kurosawa’s Dreams are constructed in a poetic and metaphoric form and go through the main life stages. They are narrative texts which evoke an experience shared by all human beings, in other words the re-elaboration of the historical memory of the Self.

After the projection of the two episodes, The Peach Orchard and Sunshine Through The Rain, the students were asked to narrate this experience freely. In this manner, the young subjects produced written texts which have been analyzed afterwards by means of the Spad-t software. This qualitative research method of the written text aimed not only to provide statistical data, from the perspectives of the IT and linguistics, but also to identify the key constructs employed by the students in their narration, re-elaborating cultural, autobiographical and oneriical elements, triggered by the stimulus they had been exposed to.

The choice of this specific tool allows the researchers to observe the lexical richness, and also to examine the main attributes used by individuals and by groups in the processes of interpretation and narration. The words become not only graphic forms expressing knowledge, but also a true device of relation and of attribution of the world, able to guide the attention, the construction of the reality and of future actions in the world. Psychological elements are discursive phenomena that are inserted in particular contexts (Harrè, Gillett, 1994) and they become real and concrete in the moment when they are codified through language, either conceived as a mode of interpersonal relationing or as a dialogue with the inner Self. In the light of these assumptions it is important that, in order to understand our research topic, to start from the observation of the corpus in its most pure form and only afterwards to analyze the relations between the various constructs used.

Results

The corpus consists of 203748 words, out of which 11029 are distinct terms. Some of the most frequent terms are: child, foxes, house etc. (see table 1). Examining the first most frequent ten words, we notice that the narration is based mainly on material and descriptive elements. The resulting list shows that there is only one word that contrasts with the homogenous matrix, “music”. Music is not understood as a mere device accompanying the images, but as a poetic element which renders the work complete. The link between music and images is fundamental for establishing and eliciting emotional responses. Matte Blanco (1981) claims that “the emotion is the matrix of the thought” and Bruner (1986) reminds us that the narration represents a cognitive mode used by individuals in order to know the world and to work out experiences. On the base of these assumptions, we cannot consider that the music represents only a background,
an accessory, but instead that it has become an evoking element that is able to arouse emotions. It is therefore expectable that the subjects’ sample uses this construct in order to describe the two episodes. The stimulus appears as a cinematographic work which is expressed by means of dreams, an element which is strongly connected to the re-elaboration of the lived experiences, starting from the emotional matrix.

Table 1: The most frequent words in the text of the two short films.

<table>
<thead>
<tr>
<th>Used words</th>
<th>Counts</th>
</tr>
</thead>
<tbody>
<tr>
<td>child</td>
<td>2437</td>
</tr>
<tr>
<td>foxes</td>
<td>1414</td>
</tr>
<tr>
<td>home</td>
<td>1207</td>
</tr>
<tr>
<td>peach orchard</td>
<td>975</td>
</tr>
<tr>
<td>mother</td>
<td>908</td>
</tr>
<tr>
<td>dolls</td>
<td>677</td>
</tr>
<tr>
<td>music</td>
<td>583</td>
</tr>
<tr>
<td>trees</td>
<td>576</td>
</tr>
<tr>
<td>rain</td>
<td>564</td>
</tr>
<tr>
<td>rainbow</td>
<td>530</td>
</tr>
</tbody>
</table>

The next step consisted in the examination of possible statistically significant differences in the perception and re-elaboration of the episodes watched. This analysis allows the calculus of the characteristic words starting from a probabilistic hypothesis of equal distribution of the words in the text. The presence of a specific lexical unit is calculated based on the variable considered. The characteristic words are judged through a test (valuer-test) which measures the difference between the percentual frequency of a graphic form in a variable data, and the percentual frequency at the global level. The level of significance is set at 0.05 (the word is characteristic if p<0.05), while the interval of the valuer-test is equal to –1.96, +1.96. Table 2 shows the first ten characteristic words used in the description of the film Sunshine Through The Rain, while table 3 includes the first ten characteristic words for the short film The Peach Orchard.

Table 2: Characteristic words for Sunshine Through The Rain

<table>
<thead>
<tr>
<th>Characteristic words or segments</th>
<th>Test-Value</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>foxes</td>
<td>33,679</td>
<td>0.000</td>
</tr>
</tbody>
</table>

The data reveal that the language is characterized depending on the stimulus and on its intrinsical content, more than according to the perceptual elaboration of the youth. The desire to be close to the presented cinematographic story may also be influenced by the specific story traits, especially by the cultural variables of the film director. This was a case where two different cultures met, the Japanese culture of the film director, and the Italian culture of his spectators. It is thus possible that the subjects have used established interpretative matrices in order to describe the episodes. The description of the watched scenes, focusing on the concreteness of the events involves a minor degree of complexity and of recodification of the signified meanings. When the subjects face diversity, understood as an uncommon experience, they appeal to the empirical memory aiming to identify in the experience lived the traits that are similar to their own cultural system and thus create continuity.

In the next stage, we have used the same method taking into account the gender variable. In this case as well, we present in table 4 the first ten words that were characteristic
The factorial analysis reveals that factor 1 expresses the transcultural dimension of the family, while factor 2 expresses the most formal dimension of the cinematographic enjoyment, or we can define factor 2 as “description of the protagonists” of the episodes and especially of the relationship between dream and family.

Conclusions

Cinema represents by itself a particular experience type. At the audio-visual level, it gives less space to imagination than the books, but the space given to the feelings and to the individuals’ personalities is larger. If we agree to the idea that a book that is inspired by another one says nothing more about this book, then we may say something similar about movies: no narration of a film can be “exact” and it takes us back to the film itself. Even an art movie like “Dreams” should be watched: its message should be conveyed or shown only through the film, without gatekeepers which “pretend to say more than the film tells us” (Calvino, 1985). According to Isen (1987), with every lecture (and with every vision) of a work of art, we understand something more, every time we fill in the blanks that were left by the previous lecture. The analysis of cinematographic productions and of the students’ perceptions may be linked to the studies made by Goffman (1959) and to his observations regarding daily relationships. The researcher describes the numerous masks worn by the subjects in their relations, as they actually “play” a role. For Goffman, the subject plays various roles in its social life and in its self-reflexivity: the role of an actor, of a director, of the scriptwriter, and lives in various dimensions of an usually extraordinary character. Individuals experience permanently the staging and these aspects recall a cinematographic production with its role-playing and dialogue construction.

The results of this research prove that the cinematographic text is codified and interpreted by the subjects by means of dimensions which aim to situate the watched fragments within their personal experiences. This is more than a mere question of taste, an element that could have represented a key factor in the given descriptions, the subjects refer to the episodes by using the description of the facts and the representations that are inherent to the family construct. Even if the family theme is present in both episodes, it is interesting that the female subjects pay attention to the actors of the institutional system. They quote such roles as mother, son, boy, sister. The evoking dimension seems to be expressed almost exclusively by the auditive perception, and the music appears both between the most frequent terms and between those characteristic for the gender variable. The dimensions linked to the lights, the colours, the emotional perceptions can almost be overlooked. This dimension needs to be investigated more deeply as there are not enough elements in order to interpret the lack of attention to these aspects.

In this case, the differences within the sample are expressed by individualizing the two groups investigated through different significated dimensions. Tables 4 and 5 show that the male sample focuses more on the aspects connected to the narrative dynamics and to its interpretative aspects. The male subjects referred more frequently to concepts such as “norms, stimuli, rituals”, and the verb “(he) said” appears among the most used verbs. The men’s description seems to be more linked to the formal aspects, having to do with the official structure of social life. The women talked about the same episodes using a more stereotypical narrative repertoire, connected to the gender differences. They referred to the dimensions inherent to the family and to its purely domestic connotations. This recodification is based on the relational dimension which is filtered by the representation of the familiar roles. The subjects actually used terms like “little boy, house, mother, family”.

<table>
<thead>
<tr>
<th>Characteristic words or segments</th>
<th>Test-Value</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>crystallization</td>
<td>5.707</td>
<td>0.000</td>
</tr>
<tr>
<td>said</td>
<td>5.510</td>
<td>0.000</td>
</tr>
<tr>
<td>ballet</td>
<td>5.068</td>
<td>0.000</td>
</tr>
<tr>
<td>temple</td>
<td>4.612</td>
<td>0.000</td>
</tr>
<tr>
<td>Norm</td>
<td>4.419</td>
<td>0.000</td>
</tr>
<tr>
<td>style</td>
<td>4.306</td>
<td>0.000</td>
</tr>
<tr>
<td>stimuli</td>
<td>4.236</td>
<td>0.000</td>
</tr>
<tr>
<td>court</td>
<td>4.230</td>
<td>0.000</td>
</tr>
<tr>
<td>Short film</td>
<td>4.115</td>
<td>0.000</td>
</tr>
<tr>
<td>rituals</td>
<td>3.909</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Table 4: Characteristic words for the male sample

<table>
<thead>
<tr>
<th>Characteristic words or segments</th>
<th>Test-Value</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>baby</td>
<td>3.879</td>
<td>0.000</td>
</tr>
<tr>
<td>home</td>
<td>3.811</td>
<td>0.000</td>
</tr>
<tr>
<td>seems</td>
<td>3.767</td>
<td>0.000</td>
</tr>
<tr>
<td>lawn</td>
<td>3.150</td>
<td>0.001</td>
</tr>
<tr>
<td>imagery</td>
<td>3.017</td>
<td>0.001</td>
</tr>
<tr>
<td>background</td>
<td>2.964</td>
<td>0.002</td>
</tr>
<tr>
<td>mother</td>
<td>2.942</td>
<td>0.002</td>
</tr>
<tr>
<td>music</td>
<td>2.883</td>
<td>0.002</td>
</tr>
<tr>
<td>run</td>
<td>2.865</td>
<td>0.002</td>
</tr>
<tr>
<td>family</td>
<td>2.845</td>
<td>0.002</td>
</tr>
</tbody>
</table>

Table 5: Characteristic words for the female sample
References


Neuroaesthetics of the Mundane

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Abstract
Aesthetics has had a long and contested history. Research in aesthetics has usually relied on feedback from participants, in the form of questionnaires, surveys, or interviews. Recently, there is much interest in obtaining physiological responses to aesthetics. This project probes for aesthetic responses—the simplest being ‘liking’ or ‘disliking’. The stimuli that are used for this experiment are images of chairs. These responses to the chairs were recorded using EEG and will be analysed for these differences and correlated with stated ratings. It is hypothesised that there will be a difference for the positive (like) and negative (dislike) responses; an observed hemispheric difference between the positive and negative responses; and that there will be an association between the ERP and the stated ratings of the image.

Keywords: neuroaesthetics; EEG; ERP; designed objects; liking; disliking.

Introduction
It is known that consumers will buy what is most aesthetically pleasing and designing for aesthetic pleasure is becoming an integral part of marketing strategies (Creusen & Schoormans, 2005; Veryzer Jr & Hutchinson, 1998). But ultimately, it is all down to the individual and their preferences and everything that makes them unique.

Recent studies have involved the use of EEG and other imaging techniques to decipher aesthetic evaluation. Novel graphic and geometric patterns are commonly used as stimuli for these types of studies (Hofel & Jacobsen, 2007a, 2007b; Jacobsen & Hofel, 2003; Makin, Wilton, Pecchinenda, & Bertamini, 2012).

In several studies by Jacobsen and his colleagues, there has been seen to be a fronto-central negative deflection that has been interpreted to be associated with the evaluation of ‘not beautiful’ (Hofel & Jacobsen, 2007b; Jacobsen & Hofel, 2003; Roye, Hofel, & Jacobsen, 2008). These studies reported right hemispherical lateralisation for evaluative judgment tasks. This lateralisation was also found for dislike judgments in music (Brattico, Jacobsen, de Baene, Glerean, & Tervaniemi, 2010).

Brattico et al. (2010) found a “less pronounced right negative difference between ‘dislike’ and ‘like’ tasks at approximately 250-300ms in the ERP.

In a study by Handy et al. (2008), where participants verbally rated logos on a 7-point preference scale, their results from the ERP were correlated with their preference of ‘like’ and ‘dislike’. There was found to be an association for ‘dislike’ at approximately 150-200ms around the central and parietal sites and an association with ‘dislike’ at 200-400ms around the parietal and occipital sites.

The experiment presented here used images of chairs; these are real designed objects. And the evaluative adjectives that were used were: Like and Comfort. The responses expected from the participants were binary response (Yes/No). These adjectives were chosen to evaluate liking/disliking based on aesthetics; comfort was a common and evaluative adjective that pertains to chairs, couches, sofas and the like. The task presented here not only requires a comfort rating, but also—and more importantly—an aesthetic evaluation.

It is hypothesised that:

a) There will be an association between the event-related potential (ERP) and the self-rated (like or dislike) of images presented.

b) There will be a hemispheric and an ERP averaged difference between stated like or dislike in the ERP.

c) There will be a difference in the ERP between aesthetic and comfort evaluations.

Method
The participants wore an EEG cap while viewing the 150 images.

For the task, there were three viewing blocks and a rating task. Each block was broken into two trials of 75 images in each. Each trial was no longer than 3-4 minutes.
Stimuli

One hundred and fifty images of chairs were used as the stimuli. They were selected based on the criteria that they had: a) back, b) seat, and c) legs. Images were selected to resemble dining/café chairs. An example is shown in Figure 1.

Figure 1: Example of a chair

Image Presentation

A Compumedics STIM² System was used to present the images. The 150 images were arranged in a pseudo-random order for the three tasks: passive viewing, aesthetic judgment, and comfort judgment. The sequence in which the fixation cross, image and blank screen occurred is shown in Figure 2.

Figure 2: Passive viewing sequence

The aesthetic judgment task required the participant to make a Yes/No response to the presented images. The comfort task was presented in the same manner as the aesthetic task, but the prompting question was replaced with “Comfortable?” The sequence for the Aesthetic and comfort tasks is shown in Figure 3.

The last task requires the participant to make ratings of the 150 images using pen and paper. These were correlated with the ERP.

EEG

A Compumedics Neuroscan/Curry System was used to acquire EEG data. A 40-channel QuikCap was used with the system; this included EOG, but only the upper vertical EOG was used.

The EEG was recorded to perform ERP analysis and the single EOG channel was used for artifact rejection. The sampling rate of the acquisition system was 1000Hz with a high pass filter setting of 0.01Hz and a low pass filter of 70 Hz. The right mastoid was used as the online reference.

Procedure

Passive Viewing Task

The two image sequences was set up to run 75 images at a time, which approximated 3-4 minutes.

Aesthetic and Comfort Judgment Task

The participant was given instructions on how to use the response box and wait for the prompt screen (“Like?” or “Comfortable?”) before pressing a button. Participants made a Yes/No response.

Rating task

The participant was given a 7-point scale response sheet that had numbers in the first column to correspond to the image number on screen.

Results, Discussion, Conclusions

(Pending.)

References


A Picture is Worth a Word: The Effect Of Titles On Aesthetic Judgments

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Abstract
In the present study we examined the effect of titles on aesthetic perception of artistic photographs. Based on the model of aesthetic appreciation and judgment (Leder et al., 2004) the process of aesthetic perception was divided into two components: an emotional and a cognitive dimension. It was hypothesized that the aesthetic judgment varies with both the intensity of emotional experience and the depth of cognitive processing. We further wanted to find out, whether it is possible to manipulate these two components independently. In an experiment with artistic black-and-white photos and single-word titles these assumptions could be confirmed. The present study demonstrates that one word beneath a picture can increase the depth of cognitive processing and the aesthetic judgment of an artwork.

Keywords: entitling art, title effects, art perception, aesthetic judgment, cognitive processing, visual artworks

I. Introduction
It is a popular saying that a picture is worth a thousand words. But can these ‘words’ be unique? Or may the meaning and even the aesthetic appreciation of a picture be influenced by contextual factors such as titles? And if so, which mental processes and structures are involved?

Leder et al.’s (2004) model of aesthetic appreciation and aesthetic judgment suggests that there are cognitive and emotional dimensions in the aesthetic experience. However, the main focus usually lies on cognitive aspects (perceptual analyses, implicit memory integration, explicit classification, cognitive mastering and evaluation), while the emotional dimension is seen as a by-product of these cognitive aspects. Our approach is based on this model of aesthetic experience, but with a more independent view of cognitive and emotional parts of aesthetic experience.

Up to now, researchers found some general effects of titles, but there has never been made a clear distinction between cognitive and emotional aspects of aesthetic experience. For instance, in a study by Franklin, Becklen, and Doyle (1993) changing the title affected individual interpretive reading of paintings. This finding suggests that the person's experience of a painting depends on specific aspects of the titles. Russel and Milne (1997) examined which components of the person's experience are affected by titles. They used abstract paintings and found an increase in meaningfulness and a decrease in abstractness. Based on Bartletts (1932) concept of effort after meaning they further expected an enlarged hedonic value of the paintings, but they could not confirm this hypothesis. In a later study with a within-subject design Russel (2003) found the hypothesized connection between an increased meaningfulness and an enlarged hedonic value as an effect of elaborative titles and further descriptions of the paintings. However these findings could not be generalized to a between-subjects design, where different people viewed the paintings either with title plus description or untilted (Russel, 2003). Millis (2001) found that metaphorical titles lead to greater aesthetic experiences than no title, random titles, or descriptive titles. Specifically, his results show that elaborate titles increase the understanding of illustrations and photographs and also improve the quality of the aesthetic experience (liking, interest, elicited thoughts and emotion). That's what he called the “elaboration effect”. Russel concluded that titles increase aesthetic experience only if they contribute to a rich and coherent representation. Leder, Carbon and Ripsas (2006) also found influences of titles on the understanding of abstract art, but not on their appreciation. In another study Belke, Leder, Strobach and Carbon (2010) focused on the fluency theory (Reber, Schwarz, & Winkelman, 2004). As expected they found that semantically related titles produced highest appreciation followed by no titles and unrelated title conditions.

Research up to now does not provide a clear picture about the actual potential of entitling art. It is clear that there are effects of titles on the understanding of (at least abstract) art. However, the connections between understanding, liking, and appreciation remain unclear. We assume that cognitive and emotional processes are two interdependent but yet separable aspects of the whole aesthetic experience. The emotional dimension was operationalized as [1] implicit liking, [2] spontaneous interest, and [3] extent of emotions, whereas the cognitive dimension referred to [1] the attributed meaningfulness, [2] thoughts, and [3] understanding of the artwork. The idea was that aesthetic judgments vary with both the intensity of emotional experience and the depth of cognitive processing. Therefore, it should be possible to separately affect them by either cognitive or emotional structuring of the context (in our study context manipulation was title manipulation). Figure 1 illustrates our assumptions. A title presented along with the artwork could either increase the intensity of the emotional component (titles such as
satisfaction or love) or it could deepen the cognitive processing (examples would be titles like equality or emancipation). Titles are seen as contextual factors, which guide the beholder’s aesthetic experience, even if there is no attention actively drawn to them. In this framework one could also think of effects of emotional music in the background or of cognitive information provided by an audio guide while visiting an art exhibition.

Figure 1: a two-process-model of aesthetic experience

We hypothesized that it should be possible to manipulate the cognitive dimension of aesthetic experience by using “cognitive demanding”, elaborative titles. These titles should increase the cognitive component of aesthetic experience (more attributed meaningfulness, more thoughts, and a deeper understanding of the artwork), whereas the emotional component should not be affected (no changes in implicit liking, extent of emotions, or spontaneous interest). The deepened cognitive processing should further lead to better aesthetic judgments for titled than for untitled photographs.

In most of the rare studies long titles were used and participants’ attention was actively drawn to them. Therefore, it could be possible that participants rated only their understanding of the words or sentences presented along with the artwork. For our objective, we wanted to use single-word titles located underneath the pictures in small letters, without any active attention drawn to them. For untitled photos, the word “untitled” appeared at the title position. Figure 2 shows an example of the setup of photo and title.

II. Methods

III. Materials

Twelve artistic black-and-white photographs by Magnum photographers Elliott Erwitt and Henry Cartier-Bresson were used as stimuli. They were presented on the screen on a black background surrounded by a small white frame. On the white frame beneath the picture the corresponding single-word title was presented (see Figure 2).

IV. Participants and Design

Sixty-two Konstanz University undergraduate psychology students, fifty of them female, participated in our study for course credit. All were art novices. No person should see the same picture with and without title. Nevertheless, we wanted to perform within-subject comparisons between the title conditions. Therefore participants were randomly assigned to one of two groups (group A and group B). All members of each group viewed and evaluated the two parallelized sets of photographs (see Table 1). Consequently, each participant viewed all twelve photographs in random order. This design made it possible to analyze both within-subject differences between title conditions (Set 1 vs. Set 2 in both groups) and between-subjects differences between title conditions (Group A vs. Group B in both sets).

Table 1: Title conditions in the two groups

<table>
<thead>
<tr>
<th></th>
<th>Group A (n=32)</th>
<th>Group B (n=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Picture Set 1</td>
<td>with title</td>
<td>untitled</td>
</tr>
<tr>
<td>Picture Set 2</td>
<td>untitled</td>
<td>with title</td>
</tr>
</tbody>
</table>

V. Procedure

Initially, the participants were informed that they would attend a virtual tour through an art exhibition with black-and-white photographs from the early to mid 20th century. Then, they were asked to look carefully at every photo and answer some questions. It was stressed that there were no right or wrong answers and that honest opinion was needed. According to the theoretically assumed time course of aesthetic experience subjects should first answer the three
emotional items and afterwards the three cognitive items on a six-point scale. See Table 2 for the exact wording of the items. After all photographs had been evaluated, participants were asked to rank the twelve photographs by their aesthetic goodness.

Table 2: Items used in the study

<table>
<thead>
<tr>
<th>Emotional items</th>
<th>1. “How much do you enjoy watching this photo?” (liking)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. “How high was your spontaneous interest in this photo?” (interest)</td>
</tr>
<tr>
<td></td>
<td>3. “To what extent did this photo evoke your emotions?” (emotion)</td>
</tr>
<tr>
<td>Cognitive items</td>
<td>4. “How meaningful does the picture seem to you?” (meaningfulness)</td>
</tr>
<tr>
<td></td>
<td>5. “How well do you understand the meaning of the photo?” (understanding)</td>
</tr>
<tr>
<td></td>
<td>6. “To what extent does the picture elicit thoughts?” (thoughts)</td>
</tr>
<tr>
<td>Aesthetic judgment</td>
<td>7. “Rate the picture’s aesthetic goodness. You can award up to 10 points with a minimum of one point.” (rating)</td>
</tr>
</tbody>
</table>

After all photos were viewed and evaluated: “Please rank all twelve pictures. Start with the picture which is the aesthetically best artwork in your opinion.” (ranking)

For analyses we formed sum scores for the variables ‘emotional intensity’ and ‘cognitive depth’, each based on three items and, therefore, potentially ranging from three to 18.

VI. Results

The results were analyzed in two steps. We first used linear regression analyses to determine whether emotional intensity and cognitive depth correlated with aesthetic judgment (rating). All 744 cases of aesthetic evaluations (62 participants × 12 pictures) were used to examine whether they support the theoretical framework (Figure 1). We then compared emotional intensity, cognitive depth, and aesthetic judgments between picture sets and participant groups with respect to the title condition to see whether titles deepened cognitive processing and enhanced aesthetic judgments (rating and ranking).

VII. Evaluation of the theoretical framework

Firstly, internal consistency of the two variables (emotional intensity and cognitive depth) was calculated as Cronbach’s Alpha. We found \( \alpha_{\text{emotional}} = .84 \) and \( \alpha_{\text{cognitive}} = .66 \). According to George and Mallery (2003), the internal consistency of survey instruments should at least achieve alphas of .60. This limit could be succeeded, even though our small number of items (three per variable) would generally rather lead to an underestimation of Cronbach’s Alpha.

Linear regression analyses revealed that the intensity of the emotional experience accounted for 62% of the variance in the aesthetic ratings, while the depth of cognitive processing alone accounted for 43% of the variance. Both predictors together accounted for 68% of the variance in the aesthetic ratings (see Table 3). In the multiple regression the error reduction was significant, regardless of the order of predictors (emotional first: \( F(1,741) = 152.695, p < .001 \); cognitive first: \( F(1,741) = 599.738, p < .001 \)). This pattern does not change when titled and untitled photographs are considered separately.

Table 3: Linear regression analyses

<table>
<thead>
<tr>
<th>Dependent variable: aesthetic rating</th>
<th>( \beta )</th>
<th>( t )</th>
<th>( p )</th>
<th>( R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression 1</td>
<td>intensity of emotional experience</td>
<td>.786</td>
<td>34.60</td>
<td>.000</td>
</tr>
<tr>
<td>Regression 2</td>
<td>depth of cognitive processing</td>
<td>.653</td>
<td>23.47</td>
<td>.000</td>
</tr>
<tr>
<td>Multiple regression</td>
<td>intensity of emotional experience and depth of cognitive processing</td>
<td>.612</td>
<td>24.49</td>
<td>.000</td>
</tr>
</tbody>
</table>

VIII. Effects of Title Condition

Paired t-tests were applied to examine title effects on the two aspects of the aesthetic experience: emotional intensity and cognitive depth. Therefore, mean differences between titled and untitled photos were calculated for each participant (Group A: Set 1 - Set 2; Group B: Set 2 - Set 1). There were positive title effects on both emotional intensity and cognitive depth. However, there was a substantially larger effect on the cognitive depth (\( t(61) = 5.584, p < .001, \) Cohens \( d = 0.92 \)) than on the emotional intensity (\( t(61) = 2.992, p < .01, \) Cohens \( d = 0.41 \)). Figure 3 illustrates these findings.

Figure 3: Titles lead to an increase in both dimensions of the aesthetic experience
On the side of the aesthetic judgments there was also a significant title effect on the ratings ($t(61) = 3.031, p < .01$, Cohen’s $d = 0.43$). For the ordinal aesthetic ranking we used a nonparametric paired sample Wilcoxon sign-rank test, which likewise showed significant positive title effects ($z = 2.969, p < .01$, $phi = 0.38$). Figure 4 illustrates title effects on the aesthetic ranking. It should be noted that 62 rankings (by the 62 participants) were included in our analyses, so that every rank (from one to twelve) was assigned 62 times. The pattern is clear: high ranks were more often given to titled than untitled photographs. Also note that the same picture stimuli occurred in the titled and untitled condition (due to inverse title condition of the sets for group A and B).

Secondly, we analyzed the ratings for the two picture sets by computing univariate ANOVAs across the two independent samples (Groups A and B) with title condition as factor. Emotional intensity, cognitive depth and aesthetic rating served as dependent variables. For both sets there were highly significant positive title effects on the depth of cognitive processing (Set 1: $F(1,60) = 17.166, p < .001$, Cohen’s $d = 1.07$; Set 2: $F(1,60) = 10.454, p < .01$, Cohen’s $d = 0.84$). Differences in the aesthetic ratings were in the expected direction, but not significant (Set 1: $F(1,60) = 2.159, p = .147$, Cohen’s $d = 0.38$; Set 2: $F(1,60) = 3.367, p = .061$, Cohen’s $d = 0.50$). Regarding emotional intensity, there were no title effects in Set 1, but significant effects in Set 2 ($F(1,60) = 4.618, p < .05$, Cohen’s $d = 0.56$). Figure 5 illustrates these findings.

For the rankings we used nonparametric Mann-Whitney-U-tests for independent samples. There were title effects on the mean ranks in both sets with 99% confidence (Set 1: mean rank$_{titled} = 38.22$, mean rank$_{untitled} = 24.33$, $z = -3.032, p < .01$, effect size $phi = 0.39$; Set 2: mean rank$_{titled} = 38.67$, mean rank$_{untitled} = 24.78$, $z = -3.032, p < .01$, effect size $phi = 0.39$).

In order to give a quick overview, Table 4 summarizes the resulting effect sizes. Cohen suggested that $d = 0.2$ be considered a small effect size, 0.5 represents a medium effect size and 0.8 a large effect size. Therefore we found large title effects on the depth of the cognitive processing, while effects on the emotional intensity were rather small and in the sets not even significant. For the aesthetic judgments (compiled as ratings and rankings), there were constantly small positive title effects.

### Table 4: effect sizes (Cohen’s $d$/$phi$)

<table>
<thead>
<tr>
<th></th>
<th>Set 1 (paired sample t-test)</th>
<th>Set 2 (t-test for independent samples)</th>
</tr>
</thead>
<tbody>
<tr>
<td>aesthetic experience</td>
<td>0.41*</td>
<td>0.29</td>
</tr>
<tr>
<td>cognitive depth</td>
<td>0.92**</td>
<td>1.07**</td>
</tr>
<tr>
<td>aesthetic judgment rating</td>
<td>0.42*</td>
<td>0.38</td>
</tr>
<tr>
<td>ranking$^a$</td>
<td>0.38*</td>
<td>0.39*</td>
</tr>
</tbody>
</table>

$^a$ nonparametric Wilcoxon-test instead of paired sample t-test and Mann-Whitney-U-tests instead of t-test for independent samples. Therefore effect sizes are phi-coefficients here.

** $p < .001$, * $p < .01$

**IX. Discussion**

Regression analyses revealed that the emotional component accounts to a larger extent for the aesthetic judgments (ratings) than the cognitive component, which suggests that emotion is a major source for a good aesthetic judgment. Interestingly, this result is inconsistent with the common view that the aesthetic value of a picture mainly depends on cognitive processes extracting the meaning of pictures. It rather appears that the immediate implicit liking, interest, and emotional attraction can explain the aesthetic judgment better than cognitive aspects of the aesthetic judgments.
experience – at least in our sample of art novices. In view of other research one might hypothesize that these findings could be reversed for art-experts, who generally have a better understanding of artworks (see Leder et al., 2006). Better understanding could also indicate a greater influence of cognitive aspects on aesthetic experience or judgment.

In fact, titles did not affect the described connections between aspects of the aesthetic experience and the aesthetic judgment. But there were title effects on the absolute level of evaluations. The largest title effects appeared with respect to the depth of the cognitive processing in the aesthetic experience. That is, there were higher attributed meaningfulness, more thoughts, and better understanding of titled rather than untitled photographs. Due to the much smaller effects on the emotional component of the aesthetic experience it can reasonably be concluded that it is possible to manipulate emotional and cognitive aspects separately, as hypothesized. Moreover, there were small but reliable effects on aesthetic judgment. Titled photographs were consequently ranked and rated higher than untitled photos. In the between-subjects comparisons of the picture sets the rating differences were not significant, but differences and effect sizes tended to be in line with the positive effects of entitling photographs for within-subjects comparisons. Possibly, these weak effects are due to the small sample size in the two groups. Further research with larger samples may be required. Due to the finding that emotion is – at least for our non-expert sample – the major source of a good aesthetic judgment the question arises, whether emotional intensifying titles would lead to even greater effects on the aesthetic judgments.

After all, we conclude that titles – even if they are just single-worded without attention actively drawn to them – are a promising and powerful way to modify the aesthetic experience in art perception.

X. References


Creativity, Hemispheric Lateralization and Academic Achievement

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Abstract

Aim of this study was to explore the relationship between Creative Thinking, Academic Achievement and lefthandedness in a sample of Secondary School Students. The sample was composed of 240 Italian students (aged 18), randomly chosen. Participants completed the TCD (Test of creativity and divergent thinking, Williams, 1994) which measures a combination of verbal skills (which depend on the left hemisphere of the brain), visual-perceptual ability and non-verbal (which depend on the other hand by the right hemisphere) in direct relationship with creativity. Participants also completed a questionnaire to obtain data concerning the hemispheric dominance. Educational achievement was measured on the basis of the last mid-year school report. Pearson Correlation, one-way ANOVA and Cramér’s index were used to verify the hypothesis.

Keywords: creative thinking, academic achievement, laterality, creative personality.

Introduction

Creativity is a basic tool for progress in any society or community. It is so important that any area of development must not lose sight of it. The conditions of modern day living characterized by complexity and interdependence, technological and communication advances, as well as rising expectations call for increased creativity (Olatoye & Oyundoyin, 2007). Professionals from all fields are becoming aware of its importance and the development of creative thinking. According to different attitudes to creativity, this concept has been defined diversely so that Runco (2007) declares that there is not “standard definition” for creativity because different theories and approaches define it variously. The contradiction in the definition of creativity and the interpretation of people about this capacity has been confirmed by the results of empirical studies. In psychological research, creativity has been considered an individual capacity to realize novel things (Guilford, 1962; Lubart, 2000; Perry-Smith, Shalley, 2003; Wai, Lubinski, Bembow, 2005); a process of becoming sensitive to problems, gaps in knowledge, missing elements, and disharmonies (Torrance, 1962); a cognitive style appearing in problem solving and decision making processes (Kirtin, 2003); an imaginative process with outcomes that are original and of value (Robinson, 2001); the production of “novelty” in everyday life (Crockley, 2001); and, generally, the most mysterious and critical human trait necessary for the advancement of humanity (Kerr, Gagliardi, 2003). Creative thinking has two aspects: Divergent Thinking (intellectual ability to think of many original, diverse and elaborate thought) and Convergent Thinking (intellectual ability to logically evaluate critique and choose the best ideas from a selection of ideas). Creative thinking is a novel way of seeing and doing things that is characterized by four components: (a) Fluency (generating ideas), (b) Flexibility (shifting perspectives easily), (c) Originality (consisting of something new), and (d) Elaboration (building on existing ideas) (Williams, 1994). The aim of creative thinking is to stimulate curiosity and promote divergence. According to Akinboye (2003), without creativity, a person is not able to access the fullness of information and resources available but is locked up in old habits, structures, patterns, concepts and perceptions. Creativity is seen as a source of innovation and therefore necessary for the personal development as well as for economic growth. Given its benefits for society and for the individual, you’d expect that creativity was a central part of education. However, despite the recent interest in this subject by politicians and academics, creativity continues to play a subsidiary role in the school, because of the multiple and divergent questions and priority programs and tests that are imposed on teachers and pupils (Beghetto, 2005). An important issue to be clarified is whether there is a relationship between creativity and academic performance. Many studies have investigated the relationship between creativity and academic achievement but previous research has inconclusive results. Some research suggests that creativity is positively related to academic achievement (Runco, 2007; Ai, 1999; Asha, 1980; Murphy, 1973). Palaniappan (2009) reported instead that there was no significant relationship between creativity and academic achievement. Naderi, Abdullah, Tengku-Aizan, Sharir and Kumar (2009) reported that neither intelligence nor creativity is a significant predictor of academic achievement among undergraduate students in Iran using CGPA scores as measures of student achievement. Edwards (1965) examined 181 ninth grade students and found that for these students, creativity was not related to school achievement. In another research investigation, Nori (2002) studied the sex difference and the type of relationship between creativity and academic achievement among high school students in Shiraz city. The analysis revealed that there was no significant relationship between creativity and academic achievement, but the result was different for the two sexes. Other researchers, such as (Behroozi, 1997; Mayhon, 1966; Tanpraphat, 1976;
Torrance, 1962) also supported the view that creativity was not related to academic achievement. Some investigators have found a low correlation between academic achievement and creativity (Karimi, 2000; Haddon, 1968; Krause, 1972, 1977). Ai (1999) wrote that some researchers in other countries also reported low correlations between school achievement and creativity test scores. Several studies analyze the role of the brain structures used in creative processes, emphasizing the difference between the two hemispheres. With regard to hemispheric dominance and laterality, Steinberg (1993) explains that the brain controls the body by a division of labor, so to speak. The LH controls the right side of the body including the right hand, the right arm, and the right side of the face, while the RH controls the left side of the body. Even though the hemispheres of the brain divide the labor of the body, they do not do evenly. In a sense, we might say that the body cannot serve two masters: one side must take charge. This phenomenon, where one hemispheric is the major or controlling one is called dominance, thus, the term hemispheric dominance. Steinberg (1993) continues that the brain assigns as it were, certain structures and functional to certain hemispheres to the brain. Language, logical and analytical operations, and higher mathematics, for example, generally occur in the LH of the brain, while the RH is superior at recognizing emotions, recognizing faces and taking in the structures of things globally without analysis. This separation of structure and function in the hemisphere is technically referred to as lateralization or more popularly as handedness: incoming experiences are received by the LH or RH depending on the nature of those experiences, be they speech, faces or sensations of touch. Munzert (1980), contrasting the functions of the two hemispheres, says that the difference between left-and-right-brain functioning is qualified by the types of mental activities which are processed in each half of the brain. The left hemisphere is the control center for such intellectual functions as memory, language, logic, computation, seriation, classification, writing, analysis, and convergent thinking. The right hemisphere is the control center for the mental functions involved in intuition, extrasensory perception, attitudes and emotions, visual and spatial relationships, music, rhythm, dance, physical coordination and activity, synthesis, and divergent thinking processes. He proceeds to explain that the functions of the left brain are characterized by sequence and order in comparison to the functions of the right brain, which are characterized as holistic and diffuse. The left brain can put the parts together into an organized whole; the right brain instinctively sees the whole, then the parts. Following this line, left brain thinking is the essence of academic success and intelligence as it is, presently measured; right-brain thinking is the essence of creativity. In studying hemisphericity and creative functioning, Torrance (1982) noted a common notion that the right hemisphere is dominant in creative thinking. Martindale, Hines, Mitchell and Covello (1984) reported on three experiments concerning the relationship between creativity and hemispheric asymmetry as measured by EEG activity. In two of the experiments, creativity was assessed with a paper-pencil test. In these experiments the creative task was to either write down or speak aloud a fantasy story. Hemispheric activity during creative activity showed the same pattern in both experiments: highly creative subjects exhibited more right than left hemisphere activation; those of medium creativity showed strong asymmetry in the opposite direction; and very uncreative subjects showed about equal activation in both hemisphere. A series of successive experimental studies reviewed by Dacey and Lennon (1998) and Martindale (1999) cite evidence in favor of the link between creativity and activity of right hemisphere. Indirect evidence of this link in some of these studies is provided by the fact that left-handed people (who tend to have the right hemisphere as dominant) were the extent of 20% in a sample of highly creative people. The purpose of this study was to explore the relationships between creativity, academic achievements and left-handedness in a sample of Secondary School Students. Given the goals of this study, the research questions were as follows:

1) What is the relationship between creativity and academic achievement?
2) Are there any significant gender differences with regard to creativity and achievement?
3) What is the relationship between lateralization and achievement?
4) What is the relationship between lateralization and creativity?

**Methods**

The study was conducted using survey design method. The factorial model of Williams (Williams, 1969; 1994) constituted the framework of the present study regarding the analysis of divergent thinking and creative personality. The author elaborated the Creative Assessment Packet, containing two different tests to examine cognitive and affective factors of creativity, respectively, Test of Creative Thinking and Test of Creative Personality. Five factors have been identified as representative of cognitive aspects of creativity: fluency, flexibility, originality, elaboration, and production of titles or ideas. The factor of fluency refers to the capacity to generate a large number of ideas and produce meaningful responses; flexibility refers to the ability to change ideas passing from one category to another; originality consists in the capacity to produce rare, infrequent, and unfamiliar ideas; elaboration is considered the ability to develop, embellish and enrich ideas with details, and, finally, production of titles or ideas refers to the verbal ability to generate new and original ideas. Four factors have been identified as typical affective dimensions of creative personality: willingness to take risks (the tendency to act under non-structured conditions and to defend one’s own ideas), imagination (the capacity to visualize and build
mental images), curiosity (the tendency to investigate elements and new ideas), and, finally, complexity (the tendency to look for new alternatives and solutions to problems).

Participants
The sample was composed of 240 Italian students (aged 18), randomly chosen and attending the last year of a public secondary school. The materials, presented in a small group, were described in the following way.

Instruments
With regard to divergent thinking and creative factors of personality, we used the Italian version of Williams Test of divergent thinking and Test of creative personality. The Test of divergent thinking was a paper-pencil test constituted by two protocols (A or B), each with 12 frames containing incomplete graphic stimuli from which the pupils are invited to draw a design or picture for a time of 20 minutes; this test measured the factors of “fluency”, “flexibility”, “originality”, “elaboration”, and, finally, “production of titles”. The fluency score was obtained by the number of completed frames; the flexibility score was obtained by the number of ideational category changes (for example, from human being to mechanical equipment) passing from one frame to another; the originality score was obtained by the number of pictures produced inside or outside the graphic stimuli; the elaboration score was obtained by the number of asymmetrical or symmetrical pictures; finally, the production of titles score depended on the typology and quality of verbal ability. The Test of creative personality was used to explore factors of personality: it consisted of 50 statements to which each subject answered in order to self-evaluate in a 4-point scale (always true, always false, partially true, partially false, I do not know) for the following factors: “curiosity”, “flexibility”, “originality”, “imagination”, and “complexity”.

Students also completed a questionnaire to obtain data concerning the hemispheric dominance. It consisted of 5 questions: 1) which hand do you use to write? 2) which hand do you use to eat? 3) which foot do you use to kick a ball? 4) which eye do you use to look through a telescope? 5) How do you cross your legs? Educational achievement was measured on the basis of the average grades of the last mid-year school report.

Findings
A-Creative performance
The results showed that our sample obtained high mean scores in fluency (M=11.61; sd=1.2) and flexibility (M=7.78; sd=2.2), scores below the average in production of titles (M=15.45; sd=5.17), scores around the average in originality (M=24.93; sd=4.7) and in elaboration (M= 15.58; sd=6.84. In general, students obtained average scores in total creative performance below standard average (M=75.60 sd=13.97).

B-Creative personality
The sample obtained high mean scores in curiosity (M=18.68; sd=3.13), complexity (M= 17.41; sd=2.91) and willingness to take risks (M=18.91; sd= 2.78); scores around the average in imagination (M=17.03; sd= 4.21). In general, students obtained average scores in total creative personality above the standard average (M=72.02; sd=10.39).

The first table shows that, with a level of significance p> 0.05, there are no statistically significant differences between males and females in average scores in achievement (p = 0.46), creative personality (p = 0.20) and creative performance tests (p = 0.46).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Gender</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>Std. Err.</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACHIEVEMENT</td>
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<td>70</td>
<td>7.28</td>
<td>0.86</td>
<td>0.14</td>
<td>238</td>
<td>0.46</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>170</td>
<td>7.38</td>
<td>0.76</td>
<td>0.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.PERSONALITY</td>
<td>Male</td>
<td>70</td>
<td>69.3</td>
<td>13.77</td>
<td>1.89</td>
<td>238</td>
<td>0.20</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>170</td>
<td>72.02</td>
<td>10.39</td>
<td>0.91</td>
<td>238</td>
<td>0.46</td>
</tr>
<tr>
<td>C.PERFORMANCE</td>
<td>Male</td>
<td>70</td>
<td>69.3</td>
<td>13.77</td>
<td>1.89</td>
<td>238</td>
<td>0.46</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>170</td>
<td>72.87</td>
<td>14.13</td>
<td>0.91</td>
<td>238</td>
<td>0.46</td>
</tr>
</tbody>
</table>

Table 2 shows the results of the study of the relationship between academic achievement and creativity: there is a negative insignificant relationship between creative personality and students’ achievement (r=-0.01 p=0.01) and a low, insignificant relationship between student’s achievement and creative performance (r=0.15 p=0.00).

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>Std. Err.</th>
<th>df</th>
<th>r</th>
<th>p</th>
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</thead>
<tbody>
<tr>
<td>ACHIEVEMENT</td>
<td>240</td>
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<td>0.06</td>
<td>238</td>
<td>-0.01</td>
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<td>71.23</td>
<td>11.54</td>
<td>0.85</td>
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<tr>
<td>C.PERSONALITY</td>
<td>240</td>
<td>7.36</td>
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<td>238</td>
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<td></td>
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<td>74.98</td>
<td>13.99</td>
<td>1.03</td>
<td>238</td>
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</table>

In order to evaluate the association between lateralization and achievement and between creativity and lateralization we calculated Cramer’s Index. We found that there is a low association between the variables lateralization and achievement (V=0.14) and a low association between lateralization and creativity too (V=0.9 for creative personality and V= 0.12 for creative performance).

Discussion and Conclusion
The present findings highlighted that this sample of Italian pupils obtained high levels for producing several ideas and changing mental categories, mean levels for realizing unfamiliar ideas and for developing elaboration and low level for verbal production. As regards creative personality, in comparison with normative data, our pupils were on average imaginative, more curious, complex and willing to take risks. In our sample males and female students have
the same level of creativity and academic achievement. Thus creativity and academic achievement seems to be variables not sensitive to gender but, one possible rationalization is that the relationship between creativity and academic achievement depends on which special aspects of creativity are being considered. For example, it would be necessary to evaluate the differences between males and females also for each component of creativity presented in TCD test. The findings of the present study provides also empirical support for previously mentioned studies that showed the lack of a significant relationship between creativity and academic achievement. When a study (conducted within a given school system) reports that there is no significant influence or relationship between creativity and achievement, there is likely to be a problem in such a system. Probably Italian school system not appreciate sufficiently creative thinking. For this reason also the students to achieve success could adapt to a system that favors convergent thinking. The results of our study reveal that there is a very low association between lateralization and academic achievement and between lateralization and creativity. We could suppose that school activity requires students, alternatively, the activation of the functions of the left hemisphere or both. Furthermore according to Taggart and Torrance (1984), we could assume that creative thinking and problem solving require both the left and right hemisphere functions.

As with all other studies, this research has some limitations. One concerns the operationalization of academic achievement. Academic achievement was measured using an grades average of the last mid-year school report in general. However, this research needs to be extended to include grades given by subject such as mathematics, language, science, and others, and standardized achievement examination scores in different fields of study. It would be also necessary to evaluate the differences between males and females not only in general but also for each component of creativity presented in TCD test. Therefore, future researches are recommended to have expanded studies relating the different aspects of creativity and achievement.

References

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creativity, gender, academic achievement and social prestige among secondary school. Shiraz: University of Shiraz.


Why Do Non-Artists Draw the Eyes Too Far Up the Face? Investigation of Knowledge and Attention-Based Factors Related to Eye-Drawing Errors

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Abstract

When observationally drawing a face, most adult non-artists draw the eyes too far up the head. The current study investigates the relationship this eye-drawing bias has with knowledge and altitudinal pseudoneglect. Before drawing a face from observation, participants were assigned into one of two knowledge conditions: (1) one group was instructed that eyes are positioned approximately half-way down the head; and (2) one group was not provided such instruction. Participants also completed a vertical-line bisection task to measure pseudoneglect. Participants in both groups were systematically biased to draw the eyes too far up the face, although subjects in the knowledge condition produced smaller errors than subjects in the non-knowledge condition. Further, participants experienced altitudinal pseudoneglect as reflected by biases to bisect a vertical line above the mid-point. Vertical eye-drawing and line bisection errors were positively correlated for subjects in the Knowledge condition, but not for subjects in the Non-Knowledge Condition. Results suggest that knowledge influences vertical eye-drawing errors, and that the mechanisms producing pseudoneglect is related to the mechanism that produces eye-drawing errors when one is aware that the eyes are positioned half-way down the head.

Keywords: observational drawing; face drawing; pseudoneglect; schematic knowledge

Introduction

One of the most common errors individuals produce when observationally drawing a face is that they position the eyes too far up the length of the head (Clare, 1983; Ostrofsky, Cohen & Kozbelt, in press). Although the eyes are positioned approximately half-way down the average adult’s head, non-artists position the eyes approximately 44-45% down the length of the head (Ostrofsky, 2013). Despite how common this error is observed, we presently do not understand the psychological mechanisms that are related to this bias. The present study aims to investigate knowledge- and attentional-mechanisms that are related to this eye-drawing error.

The goal of observationally drawing a face is to create a recognizable depiction of the model. Past studies have demonstrated that individuals’ recognition of faces is strongly influenced by the spatial positioning of features (Rotshtein, Geng, Driver, & Dolan, 2007; Tanaka & Sengco, 1997). This suggests that the perceived quality of a face drawing is influenced by the degree of accuracy in which the spatial relationships between features are reproduced in a drawing, a hypothesis that has empirical support (Ostrofsky, Cohen & Kozbelt, in press).

Due to the importance of accurately drawing the spatial relationships between facial features, a prevalent feature of drawing instruction manuals that focus on instructing students how to create high-quality face drawings is that they provide explicit instruction on how to spatially position the facial features relative to one another. For instance, many instruction manuals inform students that the eyes are approximately positioned half-way down the head (e.g. Edwards, 2012; Hamm, 1963). The underlying assumption of such instruction is that one reason why non-artists draw faces poorly is that they have not acquired the schematic knowledge of how features are positioning relative to one another in a typical adult face. Further, this type of instruction assumes that once this knowledge is acquired, drawing accuracy will improve. Such assumptions are consistent with psychological theories of drawing performance that argue that the development of skill in drawing is partially influenced by the acquisition of schematic knowledge that accurately represents the canonical structure of common objects (Gombrich, 1960; Kozbelt & Seeley, 2007). Thus, this suggests the hypothesis that one reason why individuals err by drawing the eyes too far up the head is because they have not acquired the schematic knowledge that the eyes are positioned half-way down the head. Further, this hypothesis predicts that those who have acquired such knowledge will produce smaller eye-drawing errors than those who have not acquired such knowledge.

In addition to knowledge being potentially related to vertical eye-drawing errors, attentional factors may also be related to the production of such drawing errors. Since the eye-drawing errors mentioned here reflect an upward bias, this drawing bias may be related to general upward biases in the deployment of visual attention across an object, a bias known as altitudinal pseudoneglect. Altitudinal pseudoneglect is the observation that visual information found in the upper visual field is attended to more than information found in the lower visual field. This has been most clearly demonstrated by performance in vertical line bisection tasks. When individuals attempt to divide a vertical line in half, most individuals exhibit an upward bias where
they bisect the line above the midpoint (Chieffi, 1996; Drain & Reuter-Lorenz, 1996; McCourt & Olafson, 1997; Post, O'Malley, Yeh & Bethel, 2006; van Vugt, Fransen, Creten & Paquier, 2000). Thus, the bias to draw the eyes farther up the head than they are found in the model may be produced by a mechanism that is related to the one causing altitudinal pseudoneglect.

The current study tests the hypotheses that upward biases in drawing the eyes are related to knowledge and the mechanisms producing altitudinal pseudoneglect. Participants drew a standard model face from observation and completed a vertical line bisection task. Before they began their drawing, participants were randomly assigned to one of two knowledge conditions. Participants in the Knowledge Condition were instructed that the eyes are positioned approximately half-way down the head in a typical adult face. Participants in the Non-Knowledge Condition were not provided such instruction.

If the acquisition of schematic knowledge is related to the production of vertical eye-drawing errors, we would predict that participants in the Knowledge Condition should produce smaller eye-drawing errors than those in the Non-Knowledge Condition.

If the attentional mechanism that produces altitudinal pseudoneglect is related to the production of vertical eye-drawing errors, we would expect a positive co-varying relationship between the direction and magnitude of eye-drawing errors and vertical line bisection errors.

Method

Participants

Seventy-five undergraduate psychology students at The Richard Stockton College of New Jersey participated in the study (56 females & 19 males). Compensation for participation was provided in the form of course credit. The mean age of the participants was 21.40 years old (SD = 5.44). All of the participants reported not having been formally trained in drawing at the college level. Fourteen participants indicated that they had taken one drawing class during high school, and nine participants indicated that they had taken one drawing class before high school. When asked to rate their drawing ability on a scale of 1 (poor) – 10 (excellent), the mean rating was 4.07 (SD = 1.80). Further, when asked to indicate how many hours they spend drawing on an average week, the mean response was 0.44 hours (SD = 0.85).

Materials

Free-hand Drawing Task. Participants were asked to create one drawing of a computer-generated image of an adult male face shown in the fronto-parallel view (Figure 1). The face model was created using the FaceGen Modeller software program (version 3.1). The face was generated by setting the shape and texture of the face to the: (a) "male" gender setting, (b) "30-year old" age setting, (c) "average" caricature setting, (d) "symmetric" asymmetry setting and (e) "All Races" race morph setting. A face texture was applied to make the face appear more natural (detail texture setting = "Middle Male 04" set at a modulation value of 1.0 and a gamma correction value of 1.8).

The face model was presented against a white background and displayed to participants one at a time on a 19'' computer monitor. While displayed on the screen, the length of the head was 5.69'' and the width of the head was 3.63''.

For the drawing, participants were provided an 8.5'' x 11'' sheet of plain white paper, a number 2 pencil with an eraser, and a manual pencil sharpener to create their drawings. Vertical Line Bisection Task. Participants were presented with 12 black vertical lines presented against a white background and were asked to draw a small horizontal line with the goal of perfectly dividing the vertical line in half. The vertical lines were printed on six 8.5'' x 11'' sheets of white paper. Each printed sheet of paper depicted two vertical lines, one that was printed in the upper left quadrant of the paper and the other that was printed in the lower right quadrant of the paper. The length of all 12 vertical lines was identical to the length of the model head used in the free-hand drawing task described above as it appeared on the computer monitor (5.69''). Participants bisected the lines with a number 2 pencil with an eraser.

Questionnaire. Participants were asked to complete a one-page questionnaire that asked them to indicate: (a) their sex and age, (b) how many hours a week, on average, they spend drawing, (c) how many drawing classes they took before high school, during high school and during college, (d) their self-perceived drawing ability (rated on a scale of 1 – 10), and (e) their knowledge of the canonical proportions of a human face. Specifically, they were asked to indicate approximately how far down the length of the head that the eyes, nose and mouth are positioned and how far apart the two eyes are from one another.

Procedure

The order of the tasks was the same for every participant. Namely, in order, the participants completed the free-hand drawing task, the eye drawing task, the questionnaire and the vertical line bisection task.

Knowledge Manipulation. After providing informed consent and before beginning any of the tasks, each participant was randomly assigned to one of the two knowledge conditions. Participants assigned to the Knowledge Condition were instructed by the experimenter that one of the most common mistakes people make when drawing a face is that they misplace the vertical position of the eyes along the length of the head. Further, they were told that, in order to create high-quality face drawings, it is important to know that the eyes are vertically positioned approximately half-way down the length of the head on the average adult face. In contrast, the participants assigned to the Non-Knowledge Condition were not provided any instruction before beginning the drawing tasks.

Free-hand Drawing Task. Participants were asked to create a complete drawing of the model face. The experimenter displayed the model face on the computer monitor, provided
the participants with the sheet of paper and drawing utensils, and provided the instructions of the task. Consistent with instructions provided for free-hand drawing tasks in previous observational drawing studies (e.g. Cohen & Jones, 2008; Ostrofsky, Kozbelt & Seidel, 2012), the participants were instructed to attempt to draw a copy of the face as accurately as possible. They were told that the goal of the task is to create a drawing that reproduced the exact appearance of the face as it appeared on the monitor. They were further told that their goal is not to necessarily generate a highly creative or aesthetically pleasing drawing. They were instructed to include in their drawing all the major features present in the model face as they appear, and not to include any visual details that are not present in the model. Finally, they were instructed that they could erase and modify their reproduction during the course of drawing, and that they could use any drawing technique they wished to use with the exception of tracing. All participants were given a 15-minute time limit to complete the drawing.

**Questionnaire.** After completing the drawing task, participants were asked to complete the questionnaire before beginning the vertical line bisection task. Beyond collecting demographic information, the primary purpose of this questionnaire was to screen participants relative to the Knowledge Condition manipulation. We checked to make sure that participants assigned to the Non-Knowledge condition had not previously acquired the knowledge that the eyes are positioned approximately half-way down the head. If participants indicated that they had this knowledge, their data was discarded before analysis (resulting in the discarding of 5 participants’ data). Further, we checked to make sure that participants assigned to the Knowledge Condition had acquired and retained the knowledge provided to them at the beginning of the experimental session. If participants failed to indicate that the eyes were positioned approximately half-way down the length of the head, their data was discarded before analysis (resulting in the discarding of 9 participants’ data). After this screening process was complete, there were 30 participants in the Knowledge Condition and 31 participants in the Non-Knowledge Condition. Participants assigned to these two conditions did not significantly differ with respect to age, $t(59) = 1.40$, $p = .16$, self-perceived drawing ability, $t(59) = 0.13$, $p = .90$, or the self-reported number of hours spent drawing a week, $t(59) = 0.43$, $p = .67$.

**Vertical Line Bisection Task.** Participants were informed that they would be participating in a task that aims to determine how well they are able to divide vertical lines in half. Participants were provided the first sheet of paper containing two vertical lines, and were instructed that for each, they were to draw a small horizontal line marking where they thought the precise mid-point was. The experimenter provided the six sheets of paper one at a time, collecting each sheet of paper once the two markings were complete before the next sheet of paper was provided. No time limit was imposed on each line bisection.

**Data Analysis**

**Model Face and Drawing Measurements.** Two measurements were made of the model face and drawings in cm, as illustrated in Figure 1. “A” was a measurement of the length of the head, measured as the vertical distance between the peak of the top of the head and the bottom of the lowest portion of the chin. “B” was a measurement of the vertical distance between the top of the head and the mid-point of the horizontal eye-line that intersected the pupils.

From these measurements, a spatial relation ratio was computed. “B/A” was a measure of the vertical position of the eyes relative to the length of the head (model value = 0.47).

We quantified the direction and degree of error in drawing the vertical position of the eyes by computing the following error ratio:

**Drawing Error** = Drawing Ratio Value / Model Ratio Value

Calculated in this way, ratio values greater than 1 indicate that the eyes were drawn too far down the head and ratio values less than 1 indicate that the eyes were drawn too far up the head relative to how they were positioned in the model.

**Vertical Line Bisection Task.** For each line-bisection, a measurement of the vertical distance between the top of the line and the horizontal marking made by the participants was made in cm. A bisection ratio was computed by dividing this measurement by the full length of the vertical line (14.45 cm) to compute the vertical positioning of the bisection relative to the length of the vertical line. Bisection error ratios (the
degree to which participants erred in dividing the line in half) were calculated as:

\[
\text{Bisection Error} = \frac{\text{Bisection Ratio Value}}{0.5}
\]

Calculated this way, a ratio value greater than 1 indicates that the line was bisected below the midpoint, and a ratio value less than 1 indicates that the line was bisected above the midpoint. Since bisection errors did not significantly vary across the 12 bisection trials, \( F(11, 671) = 1.08, p = .38 \), the 12 bisection error values were averaged for each participant, thus resulting in a single mean bisection error ratio value per participant used for data analysis.

**Results**

**Free-Hand Drawings.** Figure 2 provides the mean values of the B/A spatial relation ratio and Figure 3 provides the mean values of the drawing error ratio for the participants in the Knowledge and Non-Knowledge Conditions. In order to determine if participants’ vertical eye drawing errors were random or systematically biased in a single direction, two single-sample \( t \) tests were conducted comparing the distribution of error ratio values to a test value of 1 (indicative of zero error). Participants were systematically biased to draw the eyes farther up the face than they were positioned in the model (the error ratio value was significantly less than 1); this was evident in the drawings of participants in the Knowledge Condition, \( t(29) = -4.93, p < .001 \), Cohen’s \( d = 0.90 \), and in the Non-Knowledge Condition, \( t(30) = -8.46, p < .001 \), Cohen’s \( d = 1.52 \). Participants in the Knowledge Condition produced significantly smaller eye-drawing errors than participants in the Non-Knowledge Condition, \( t(59) = 3.40, p < .01 \), Cohen’s \( d = 0.87 \).

**Vertical Line Bisections.** In order to determine if participants experienced an upward bias in their vertical line bisections reflective of their experience of altitudinal pseudoneglect, two single-sample \( t \) tests were conducted comparing the distribution of mean bisection error ratio values to a test value of 1 (indicative of zero error). Participants exhibited a reliable upward bias, or in other words, a systematic bias to bisect the line above the midpoint; this was evident in the bisections of participants in the Knowledge Condition (\( M(SE) \) bisection error ratio value = 0.97 (0.00)), \( t(29) = -6.69, p < .001 \), Cohen’s \( d = 1.22 \), and participants in the Non-Knowledge Condition, (\( M(SE) \) bisection error ratio value = 0.97 (0.01)), \( t(30) = -4.52, p < .001 \), Cohen’s \( d = 0.81 \). Mean bisection error ratio values did not significantly differ between participants in the Knowledge and Non-Knowledge Conditions, \( t(59) = 0.11, p = .914 \), Cohen’s \( d = 0.03 \).

**Relationship between Eye-Drawing and Line Bisection Errors.** In order to determine if there was a co-varying relationship between errors in vertical position of the eyes and errors in bisecting a vertical line in half, Pearson \( r \) correlation coefficients were calculated separately for participants in the Knowledge and Non-Knowledge Conditions. There was a significant positive correlation between these two errors for participants in the Knowledge Condition, \( r(27) = .52, p < .01 \). In contrast, a significant correlation between these errors was not observed for participants in the Non-Knowledge Condition, \( r(28) = -.12, p = .53 \).

**Discussion**

Evidence is provided here that the systematic error produced by most adults to draw the eyes too far up the head is related to knowledge- and attentional-based processes. One reason adults seem to draw the eyes too far up the head is that
they have not acquired the schematic knowledge that the eyes are positioned approximately half-way down the head. Participants who were explicitly provided this knowledge produced smaller errors in vertically positioning the eyes in their face drawings compared to participants in the Non-Knowledge condition. More specifically, participants in the Knowledge Condition positioned the eyes farther down the head than participants in the Non-Knowledge Condition. However, being provided this schematic knowledge did not result in a complete elimination of the systematic bias to draw the eyes too far up the head as participants in both conditions systematically drew the eyes farther up the head than how they were positioned in the model. Thus, such schematic knowledge appears to affect the magnitude of this systematic error bias, not the presence versus absence of this bias.

Even though participants in the Knowledge and Non-Knowledge Conditions both had a systematic bias to draw the eyes too far up the head, we suggest that there are different reasons why this error bias is present between those with and without schematic knowledge of the typical vertical placement of the eyes. With respect to participants in the Knowledge Condition, once having acquired the schematic knowledge that the eyes are positioned approximately half-way down the head in the typical adult face, why do individuals persist in drawing the eyes too far up the head? We suggest that their persistent bias to draw the eyes too far up the head is related to the mechanisms producing altitudinal pseudoneglect, or the bias to allocate visual attention much more strongly to the upper visual field than the lower visual field. This is evident by the positive co-varying relationship between vertical eye-drawing errors and vertical line bisection errors (reflective of altitudinal pseudoneglect) in the participants assigned to the Knowledge Condition. When attempting to utilize the knowledge that the eyes are positioned approximately half-way down the head, this positive correlation suggests that the participants attend to the upper visual field of their drawing more than the lower visual field, resulting in the bias to position the eyes too far up the head similar to how individuals bisect a vertical line above the midpoint when attempting to divide it in half.

In contrast, since there was a lack of a significant co-varying relationship between eye-drawing and line bisection errors with respect to participants in the Non-Knowledge Condition, we suggest that the reason these participants draw the eyes too far up the head is unrelated to altitudinal pseudoneglect. This bias may be produced by not having accurate knowledge of where to position the eyes on the face. However, this explanation does not explain why the eyes are systematically positioned too far up the face as opposed to too far down the face. Although the cause of the upward bias is presently unclear, one may speculate that it is related to how attention is deployed to the forehead region. Eye-tracking research has demonstrated that visual attention is deployed more frequently and for longer periods of time to the eye region than the forehead region when individuals perceive a face (Heisz & Shore, 2008; Nguyen, Isaacowitz & Rubin, 2009). This relative inattention to the forehead region may be adaptive for face recognition purposes, as greater visual attention to the forehead region has been found to be associated with a weaker ability to recognize faces (Corrow, Donlon, Mathison, Adamson & Yonas, 2013). However, for the purposes of accurately depicting the spatial configuration of features in a face, this inattention of the forehead might be maladaptive as it would impair the ability to achieve this drawing-related goal. As hypothesized by Edwards (2012), inattention to the forehead may lead to an attenuation of the perceived extent of this region, causing the eyes to be positioned farther up the head than how they are positioned in the model being reproduced.

In any respect, our results more generally inform psychological theories of drawing performance. In contrast to theories that conceptualize prior knowledge exclusively as a source of interference in the task of producing an accurate drawing (Glazek, 2012; Ruskin, 1857), our results suggest that some types acquired knowledge can facilitate aspects of drawing performance. Our results validate, to some degree, the popular use of drawing manuals that provide students schematic knowledge about the graphical properties of common objects (e.g. Hamm, 1963; Hogarth, 2002; Kraavanger, 2005; Okabayashi, 2009). Generalizing from our findings, the observation of facilitating effects of schematic knowledge on drawing performance may inform our understanding of how drawing skill develops through training and experience. As Gombrich (1960) and Koizumi and Seeley (2007) have argued, development in drawing skill may be accompanied by an increasingly sophisticated and accurate set of knowledge relating to the graphical properties of common objects. Thus, rather than conceptualizing the difference in ability between skilled and unskilled drawers as unskilled drawers relying on prior knowledge more than skilled drawers, both skilled and unskilled drawers may equally rely on prior knowledge, with the difference being the accuracy and sophistication of the graphic representations stored in long-term memory.

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Aesthetic Absorption in Music: Exploring Subjective Experiences

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Abstract

This paper presents findings from my on-going study on musical experiences occurring in ‘aesthetic contexts’. Ideally, these contexts oppose everyday-life occurrences of casual and inattentive forms of listening to music. The primary aim of this qualitative study is to investigate feelings of absorption where attentive listening is considered to be the norm rather than the exception, as actual listeners report it directly after listening to a piece of music. It intends to (1) examine the intensity and varieties of absorptions characterizing the musical experience, accounting for possible differences across musical genres, (2) identify participant-perceived musical causes of absorptions, and (3) clarify its relationship with appreciation.

Keywords: altered states of consciousness; absorption; qualitative research; aesthetic experience.

Background

Having an ‘aesthetic experience’ when listening to music has repeatedly been understood throughout history as one in which the individual is being ‘absorbed’ in the music (e.g., Brattico & Pearce, 2013). An absorption, which may stem from the oldest cultural layers of music as an instrument for shamanistic ceremonies and religious rituals. Yet, at the same time aesthetic experience and absorption in music appear to involve a paradox: On the one hand, we have the controlled understanding of following the music’s course which is usually taken to be part of the aesthetic experience of music. On the other hand, there is the uncontrolled nature of feeling displaced from the here and now and becoming ‘at one with the work’, at the expense of everything else. How can these seemingly contradictory phenomena be related to each other?

Perhaps for the fear of seeming irrational or wacky, so far only a handful of philosophers has discussed and defined these absorption-states as part of aesthetic encounters in closer detail. For example, a detailed description comes from Benson (1993), defining aesthetic absorption as the “the engagement of self” which is “active, chosen, informed, attentive, demanding, and – depending on the quality of the art – enlarging” (185). In similar terms, Rowe (1991) emphasizes the controlled nature of attentive absorption specific in ‘aesthetic contexts’,24 where it should be “unwilled but the will is not against it”. This type of engagement is conceived of as particularly rewarding and is typically associated with ‘proper’ ways of musical engagement.

In empirical terms, though, it still remains unspecified if and how this aesthetic absorption in music indeed sets itself out from other types of musical engagement, some of which might be more trivial and sought after for ‘mere’ superfluous enjoyment. Many types and degrees of altered states of consciousness exist, of which some easily alternate with each other during the course of listening to a piece of music. As Herbert has indicated (2011), these vary from feeling totally absorbed (continuous and effortless attention to an object), to relaxation, non-pathological dissociation, or mind-wandering. She therefore questions the today still implicit dichotomy of directed (music as main focus) and undirected listening (music as background), critically asking whether it would be possible to “demarcate the special from the everyday” in the first place.

Aims

This paper investigates whether the transcendental state-of-mind that characterizes the aesthetic experience with music is indeed exceptional in its phenomenological appearance, or not. Using a qualitative approach, I examine what phenomenologically happens to the subjective listener when being ‘aesthetically absorbed’ with attentive listening as its main requirement or presumption.

Aesthetic Experience

Admittedly, aesthetic experiences are complex and multifaceted. Yet, in order to clearly define which musical experiences are considered for the analysis of absorptions, it is necessary to demarcate more precisely what is meant by it.

Clearly, aesthetic experience finds itself amidst a large number of closely related yet often slightly different conceptualizations. Peak emotional experiences (Lowis, 2003), strong experiences (Gabriëls and Wik 2003; Gabriëls 2011), intense musical experiences (Schäfer, Smukalla and Oelker, 2014), and aesthetic chills (Nusbaum and Silvia, 2011) are but a few examples in the literature which are often aligned with aesthetic experience. However, some of these constructs are intended to describe experiences with music which often occur unintentional, are almost exclusively emotional in nature, and are rather exceptional in terms of frequency, their duration in time and intensity. These qualities might not always fit well to those instances of intentional and attentional forms of music listening, with its clear emphasis on focus, contemplation, and its reward-seeking nature in terms of understanding.

I therefore suggest that aesthetic experience with music does not have to occur per se by chance. Instead, I take aesthetic experience to be related to Maslow’s lesser-known but more frequent-occurring ‘plateau experiences’. According to Maslow, a plateau experience “always has a noetic and cognitive element, which is not always true of

24 For the distinction between music in everyday life versus in aesthetic contexts, see Sloboda (2010).
peak experiences, which can be purely and exclusively emotional” (Maslow, 1970). Plateau experience can be “achieved, learned, and earned by long hard work” which as such can be aimed for and where it takes time and effort to experience the necessary “maturing, experiencing, living, learning” (1970). From this perspective, aesthetic experiences with music occur more frequently than ‘the most memorable’ or ‘the most intense’ musical experiences. Accordingly, they can be expected to occur when participants are allowed to listen to self-chosen pieces of music as stimuli which are involving or engaging to her.

Method
Many studies on ‘special’ music experiences are often subjected to severe alteration through personal reflection, especially when referring to experiences more than a decade ago. For example, in a recent study on the psychological qualities of ‘intense musical experiences’ with music by Schäfer, Smukalla and Oelker (2014), more than 30% of the interviewees talked about their intensive experiences which happened 15 to 50 years ago. In contrast, then, avoiding to rely on these past experiences (e.g., Gabriellson, 2011; Rana, Tanveer, & North, 2009), this qualitative study chooses to analyze the absorptive character of musical experiences based on self-report observations of very recently occurring listening experiences.

In study 1, respondents with various backgrounds participate in a two-hour individual in-depth interview session. In order to secure stability in musical involvement and to increase the ecological validity of the study as much as possible, the interviews are based on two or three participant-selected ‘involving’ pieces of music chosen in advance and brought to the interview. The term ‘involving’ is preferred in the beginning of the interview above words like absorption, trance or altered state of consciousness, thus avoiding priming the interviewees already from the start of the interview to conceptualize their experience as such.

After listening to a piece of music, the participant answers questions according to a semi-structured protocol. This protocol covers the themes of the perceived effects on mind and body during and directly after listening, attentional aspects (e.g., control, fluctuation, and vigilance), the perceived specialties of the music relevant in bringing about the involving experience, and lastly probing the perceived long-term impact of the experience. To probe deeper on participant-perceived musical causes of absorptions, study 2 uses the multiple sorting task [MST] in order to obtain this often ‘hard-to-verbalize’ information using a different group of participants. By means of repeated sortings of a number of self-brought pieces of music based on self-proposed criteria (i.e., musical parameters), elements in the music which contribute in the experience are uncovered. The MST forces participants into a self-conscious and usually quite intense analysis of their own musical experiences, enabling deeper access to their subjective meanings (see Sixsmith & Sixsmith, 1987).

Main Contribution
Based on the obtained results of my ongoing study, this presentation explores:
1. The different types of reported altered-states (if any) that part of the involving musical experience, accounting for the similarities and differences across musical genres. I show whether they match or are incompatible with the profiles suggested in aesthetic philosophy.
2. The influence of specific kinds of consciousness upon aesthetic appreciation, clarifying how attentional focus develops during involved listening.
3. The main components of being aesthetically absorbed by music found in the reported musical experiences (cf. Benson 1991), with an emphasis on those which differentiate attentional behavior. These components are first derived independently and then later compared with the elaborate descriptive system for strong experiences of Gabriellson and Lindström Wik (2003) in order to determine resemblances and differences with strong experiences.

Implications
Although Gabriellson and Lindström Wik (2003) argued that SEM “cannot be simply identified with altered states of consciousness”, others started to make this link more explicit. For instance, Schäfer, Smukalla and Oelker (2014) are much stronger in their claim about this relationship, suggesting that intense musical experiences and altered states of consciousness are of a highly similar nature, if not identical. Whether this is true or not, I think it is precisely the possibility of music offering these different kinds of absorbing experiences that makes us return to and appreciate music. By conceptualizing aesthetic experience with music in terms of altered states of awareness, i.e. absorption, I think a fruitful way opens up for tackling the complexity of aesthetic experience. Qualitative research is underlined as being a valuable tool for giving a completer picture of what it means to be absorbed in music while listening. It permits to probe deeper into the holistic nature of this type of experience and even allows to be compared with described musical experiences uncovered by historical reception research.

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Subjective Experience of the Beautiful in Flamenco Dance

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Abstract
The starting point of this paper, the aim of which is to examine the subjective experience of dance from the spectator’s perspective, is the cognitive model of aesthetic decision making. The participants were tested for differences in evaluation according to the criterion of the beautiful in choreographies of varied aesthetic modes, presented in two styles of flamenco dancing. Each one of the 6 choreographies shown was presented in three aesthetic modes: a harmonious (H) auditory visual presentation in which the choreography is simplified, a redundant (R) presentation in which the basis of the choreography is ornamented, and an original (D) choreography, work of a flamenco choreographer. The results showed that the choreographies differed in beauty depending on the aesthetic mode, and that there was a predominant preference among the participants for the R type of choreographies. Such a preference may be influenced by the way of presenting the stimulus as well as the participants’ level of general knowledge, but it also confirms the basic idea of the art of flamenco.

Keywords: aesthetic preference, cognitive model of aesthetic decision-making, beautiful, flamenco dance.

In this paper, dance is regarded as a specific type of complex and highly articulated movement (Savić, 2006), or in other words, as a creative product on stage merging an impeccable and even perfect dancing technique with the spiritual content of an artist in order to reach aesthetic actions and achieve an aesthetic aim – the spectators’ experience (Krešić, 1997). If observed within the context of historical development, it may be noticed that dance is a highly complex human activity which serves many purposes (Layson, 1994). It is often directly associated with the creative process, whereby its property to communicate with the spectator is emphasized, particularly through metaphors which are further shaped by formal characteristics of the certain type of dance (Tufnell & Crickmay, 2006; Blom & Chaplin, 2000; Meekums, 2005; Pallaro, 2006).

According to Adshead, Briginshaw, Hodgens and Huxley (1982) there are three central features characterizing each dance: choreography, performance and appreciation, and all of them are inextricably bound to the importance of the dancing context (McFee, 1992; Layson, 1994) in which the attendance of spectators is assumed. There are three formal aspects distinguished within dance: the aesthetic aim of the dance, the manner of performing a dance and the types of the dance (Krešić, 1997). Another way to classify dance (Kahlich, 2011), which may help to understand the role of dance today, is to organize it into four main areas: artistic, theatrical, traditional, and social/ recreational.

This paper investigates the spectators’ experience of dance while observing the unique dance form of flamenco. In this paper, flamenco dance is understood as a form of artistic and traditional dance as well, since throughout its history flamenco evolved from earlier more traditional forms to be recognized as an artistic form (cf. Gamboa, 2011). In that sense flamenco represents a unique form of dance.

Flamenco Dance
Flamenco dance originates from Andalusia, or more precisely, from the triangle comprising Seville, Cadiz and Cordoba, and it was built on the cultural remains of many peoples going through or settling on the territory (Grande, 1987). According to Grande (1985), apart from the remnants of Byzantine and Jewish culture we may recognize elements of Arabic and Gypsy culture on the historical map of flamenco. The influence of Christians, Muslims and Jews on forming flamenco was indirect, and meant that these peoples and religions formed the culture of Andalusia, the region from which flamenco originates (Grande, 1985). Although flamenco has existed over centuries and it has a multiethnic origin, it was recognized as a form of art just over 200 years ago (Rebollar Peinado, 2008; Gamboa, 2011).

The artistic expressions of flamenco include dance, singing and guitar-playing. Even though flamenco has evolved throughout centuries, today there is the presence of the essence based on encouraging particular and individual expression within the group and in order to support it (earlier it was family, but today it is a group of artists). Nowadays, encouraging particular and individual expression within the group is seen in the principles of ordering and changing artists within the artistic performance of flamenco (Barrios, 1989).

Since singing formed the basis on which this form of art developed, the distinction between different ways and styles of performing flamenco (Barrios, 1989) can be made according to singing (Barrios, 1989). Depending on rhythm, verses and sources, singing in flamenco is characterized by many styles (Rebollar Peinado, 2008). Every style (palo) has its name, unique musical features, emotional tone and rhythmic measure (compás) which has the most prominent role in defining particular style (Rebollar Peinado, 2008). Within one style different distinctions can be made depending on the specific interpretation of the certain artist or specific features relating to the certain area (Barrios, 1989).
On the other hand, flamenco dance has a specific and complex technique including an extremely upright position, special and complicated footwork technique as well as typical handwork (Gómez Muñoz, 2008; Ortega Rubio, 2008). It is usually performed in direct interaction with the singing and accompanying music (Gómez Muñoz, 2008) and requires "uniquely personal power of expression" (Gómez Muñoz, 2008) whose aim is to transfer feelings (Gómez Muñoz, 2008), which are usually expression of experience and everyday life (Castaño Hervás, 2008). Since flamenco dance is a relatively rarely researched area of the psychology of art, this paper aims to find out how the spectators evaluate by the criterion of beautiful the choreographies of flamenco dance and whether the style in which the choreography is shown influences their subjective experience. Therefore it is decided to show flamenco choreographies in the styles of bulerías and tangos since they are two most widely danced styles (Gómez Muñoz, 2008) of flamenco relevant for our research.

**Bulerías.** Either performed as a separate composition or at the end of a composition, bulerías is an entertaining style leaving space for different movements and improvisation (Gómez Muñoz, 2008). This style has a twelve-beat compás, which is accentuated in different ways and has a faster tempo with from 230 to 300 beats per minute (Candelori & Díaz, 1998). From the etymological perspective, this term represents a Gypsy version of the word burlar meaning racket, to mock, and thus the theme of bulerías refers to this meaning since it is amusing, funny, dynamic and swift and is performed at wedding feasts, celebrations and festivals (Candelori & Díaz, 1998). The styles of bulerías are numerous and we may classify them into two groups, and these are bulería festera for dancing and bulería a golpe for singing (Candelori & Díaz, 1998).

**Tangos.** It is one of the oldest styles that was, along with bulerías, traditionally sung at parties (Rebollar Peinado, 2008). According to Candelori and Díaz (1998), this style of flamenco characterizes singing which is joyous, swift and full of bright feelings. The song is accompanied by dance, and a simple compás allows improvisation. The compás consists of four beats, whereas the tempo is quite faster and has 130 beats per minute (Candelori & Díaz, 1998).

In the research of experience of flamenco, the cognitive model of aesthetic decision making (Ognjenović, 1991, 2003) served as a theoretical basis. Relying on a cognitive model of aesthetic decision making while examining subjective experience of dance, our aim was to investigate whether there are different evaluations of spectators by the criterion of beautiful in the choreographies of different aesthetic modes, which are shown through two styles of flamenco dance.

**Cognitive Model of Aesthetic Decision Making**

The cognitive model of aesthetic decision making is based on experimental findings (Ognjenović, 1991, 2003) of the research referring to preference choice for visual aesthetic stimuli which were modified in three different ways: harmony, symmetry (H), redundancy, decoration (R), and distant, original piece of art (D). H (harmony) type of stimulus meant the simplification of the original visual material. R (redundance) type of stimulus meant enhancing and decorating of the original visual material. D (distant) type of stimulus meant the original visual material.

The studies showed that preference changes depending on exposure of stimulus duration. The exposure of stimulus duration varied (500ms, 1000ms and 1500ms). At the shortest exposure duration H type of stimulus was dominant. An increase in exposure of stimulus duration shifted preference to R type, whereas a further increase in exposure of stimulus duration made D type of stimulus dominant. A model of aesthetic decision making (Ognjenović, 1991, 2003) includes three consecutive stages, placed in a cognitive block at different depths and with different operative characteristics. According to Ognjenović (1991) the final aesthetic decisions can be formed from different operative characteristics distinctive for each consecutive stage. The first, a consecutive stage (H) leads to decision in favor of harmony, good form, symmetry and accord. Unlike this consecutive stage, the next stage (R) leads to decision in favor of ornamentation and wealth of detail, whereas the third consecutive stage (D) brings decision in favor of semantic depth.

The studies confirmed that preference of H, R or D types of stimuli depends on many factors. These factors are as follows: exposure to visual material exposure (Ognjenović, 1991), level of general knowledge (Ognjenović & Morače, 1994), age of participants (Marković & Marković, 1994), profession (Ognjenović & Morače, 1994; Škore 1994; Pejić, Grba Singh, Bakić, Radonjić, Vukmirica, Ristić, Vujić, & Gazdić, 1997; Pejić, Grba Singh, Gazdić, Bakić, Radonjić, Ristić, & Vukmirica, 1998) and type of aesthetic material (Graovac, 1994; Vidović, Tomović, Ristić & Milićević, 2002).

Cognitive model of aesthetic decision making with three consecutive stages (Ognjenović, 1991) found its application in investigating aesthetic experience of visual and auditory stimuli in the field of different art forms: visual arts (Pejić, 1999, 2004; Škore, 1994; Milićević, 2005), theatre (Ristić & Radonjić 2001, 2002a, 2002b; Ristić, 2006; Vidović, 2007) and music (Graovac, 1994; Milićević & Ristić, 2004). The field of dance art remained not investigated. This paper, therefore, has the aim to investigate aesthetic experience within dance art. As the above-mentioned references showed when an object is presented in H, R and D aesthetic modes there are different responses to preferences of these modes. Thus in this paper we suggest that stimuli of dance art will show similar outcomes. Accordingly, we assume that when the certain choreography is presented in H, R and D aesthetic modes, the spectators’ experience of dance will be different, i.e. there will be different responses of spectators regarding preferences of choreographies. Thus, cognitive model of aesthetic decision making served as a theoretical basis for this research in the field of dance art, or more precisely, in the field of flamenco dance.
Starting from the above-mentioned findings, the following questions have arisen: Are choreographies of flamenco of different aesthetic modes experienced in different ways? If different, what aesthetic mode is regarded as the preferred? Likewise, do the evaluations of choreographies depend only on the aesthetic mode or does the style of flamenco dance in which the choreography was presented also have its influence?

**Method**

The aim of the research was to investigate whether there are statistically significant differences in the assessment of spectators by the criterion of beautiful in the case of the choreographies with different aesthetic modes performed in the styles of tangos and bulerías.

**Participants**

There were 67 third-year students of Psychology from Faculty of Philosophy in Novi Sad who took part in this research. There were 13 male students and 54 female students (mean age = 22.3 years). The participants didn’t have any direct experience with dance training. Students participated voluntarily and they didn’t receive course credit nor any fee.

**Stimuli**

The stimuli consisted of six dance choreographies of flamenco, whereby there were three choreographies in the style of bulerías and three were in the style of tangos. Each of these six choreographies had three aesthetic modes: harmony (H), redundancy (R) and distant (D). D types of choreographies are original combinations of dance movements of flamenco made in accordance with the requirements of flamenco style tangos and flamenco style bulerías. The other two types of choreographies are variations of the original in the direction of simplicity and symmetry (H types of choreography), or ornamentation and redundancy (R type of choreography).

The original choreographies and their variations were made and performed by a flamenco choreographer María Kéck from Madrid. The choreographer was aware of the hypothesis and she made the choreographies and their variations for the purpose of this investigation.

There were 18 choreographies – stimuli in total, and they were presented in a random order. Each of these eighteen choreographies lasted for two minutes, and the time was controlled by the recordings of rhythm (compás) that accompanied choreographies while performing.

**Procedure**

The choreographies were presented by a video projector in the form of a visual and auditory recording according to the balanced order established beforehand. The participants observed the recordings in groups, and having finished watching each recording, they immediately made assessments. The participants were told to direct their estimations of beautiful to the dance movements. The time allotted to the assessment after seeing the choreography totaled one minute.

**Task for participants**

The task for the participants was to assess each aesthetic mode of all six choreographies (18 stimuli in total) by the criterion of beautiful on the seven-point bipolar scale. The scales ranged from -3 (ugly) to +3 (beautiful). The first independent variable is an aesthetic mode and has three levels H, R, D (six original choreographies, each varied by H principle and R principle). The next independent variable is the style of flamenco choreography and has two levels (three choreographies were performed in the style of tangos, whereas the other three were performed in the style of bulerías). There were eighteen choreographies in total. The dependent variables were assessments by the criterion of beautiful for each of eighteen choreographies.

The analysis of variance was used for data processing. The statistical significance of the aesthetic mode effect was checked as well as the statistical significance of the style effect on the assessment of choreographies by the criterion of beautiful. Finally, the significance of aesthetic mode x style interaction was checked.

**Results**

The results show that the significance of the effect of aesthetic mode is confirmed $F(2, 1205) = 20.403, p < .000$. This suggests that participants assessed differently according to the criterion of beautiful, the choreographies of different aesthetic mode, regardless of the dance style (bulerías or tangos).

The significance of the style effect is not confirmed, which means that the participants do not differ in their assessments according to the criterion of beautiful when it comes to two different styles of flamenco dance. Therefore, the assessments of the choreographies in the style of tangos and the choreographies in the style of bulerías by the criterion of beautiful are not different.

The analysis showed a statistically significant interaction between the aesthetic mode and style $F(2, 1205) = 4.222, p < .05$. The interaction between the aesthetic mode and style suggests that there is a different distribution of assessments according to the criteria of beautiful depending on the aesthetic mode and the style of the choreography of flamenco.

The additional analyses extended the results. There was a partial analysis of variance in which the significance of the aesthetic mode within each style was tested. The results showed that the choreographies of different aesthetic mode performed in the style of tangos differ significantly $F(2, 600) = 22.388, p < .01$ among each other according to the criterion of beautiful, as is not the case with the choreographies of different aesthetic modes performed in the form of bulerías.
As for the different aesthetic modes of choreographies performed in the style of tangos, Least Significant Difference test shows ($p < .05$) that the choreographies of R type of choreographies ($M = 2.204$, $SD = 1.01$) significantly differ according to the assessed criterion of beautiful from the choreographies of H type of choreographies ($M = 1.517$, $SD = 1.17$) and from the choreographies of D type ($M = 1.602$, $SD = 1.16$), whereas the choreographies of H and D types do not differ significantly.

Our assumption is that these differences can be attributed to the stimulus itself, which included the choreographies of tangos and bulerías. As the choreographies of tangos are based on the four-beat rhythm, the differences between the choreographies of different aesthetic modes were evident. It is different with the choreographies of bulerías which are based on the twelve-beat rhythm and are probably similar to each other for our participants who have no experience with flamenco.

**Discussion and Conclusion**

The results showed that the choreographies of flamenco with different aesthetic modes had different aesthetic assessment. By the criterion of beautiful in which the choreographies are presented, there are no statistically significant differences by the criterion of beautiful between the choreographies performed in the style of bulerías and those performed in the style of tangos. This result supports the assumption from which we started, and which is in accordance with the cognitive model of aesthetic decision making, that if we present the choreography in H, R and D aesthetic modes, there may be different responses of the participants regarding the preference for the choreographies of a particular style. And it was shown. The redundant (R) aesthetic mode is distinguished as the preferred. Therefore, the R type choreographies of flamenco are assessed as the most beautiful.

This result can be interpreted in several ways. On the one hand, as the choreographies were shown to the participants by video projector so the participants did not watch them live and the art of dance receives its full expression when it is presented live in front of audience (Jowitt, 1994; Vukadinović, 2010), especially in the art of flamenco dancing (Gómez Muñoz, 2008) where the presence of the audience contributes significantly to the increase in the semantic depth of the artist’s expression, it was necessary to take into account that watching the recording is a potential confounding variable because a filter medium is involved in art (Vukadinović, 2010, 2008; Ristić, 2006). Therefore, we assume that the way in which stimuli are presented may form assessments of participants in the direction of the preference of choreographies of R type choreographies.

On the other hand, these results are very similar to the results obtained on the visual material, which showed that the participants have a dominant preference of R type (Ognjenović, 1994). Based on the similarity of the results of the above-mentioned research and the results of our research, we assume that our results, which also show a dominant preference for the R type choreographies, based on analogies confirm the dependence of the modes of aesthetic decision making on the level of general culture.

When we take into account all the restrictions regarding the potential confounding variables, the presentation of stimuli, the level of the culture of participants, it is to answer further questions that arise. These include whether the preference R types of choreographies might be related to the form of flamenco art. Maybe flamenco dance hides its main "advantage" in the aesthetic mode decoration?

For this result, i.e. the preference of the R types of choreographies, there is a number of elements that are in favor of such assessments, and these are the essential features of the art of flamenco. On the one hand, these are formal elements of dance requiring a special hand work, by which the art of flamenco is known, then the rhythm of footwork, and the better in the rhythm the more virtuous the artist is; then typical flamenco turns, which do not look like ballet turns, harmonious and symmetrical, but are performed at a certain angle and curve (Candelori & Diaz, 1998). The costume is also a supporting element. Although in our research, the same black costume is used in all choreographies, without detail and decoration that distract participants from the dance, the form of the costume itself (Ortega Rubio, 2008) is rich in material and consists of a wide skirt or dress with flounces which seem rich. When it is taken into account what has previously been a costume for flamenco (Ortega Rubio, 2008), as, for example, different colors of flounces, dots, scarves and hair combs, which are classic flamenco costume, and we can undoubtedly talk about the R type of aesthetic mode.

In addition to these formal features of the dance, some of the basic ideas of artistic expression in flamenco can suggest that flamenco dance hides its main "advantage" in the aesthetic mode of decoration and ornamentation. The flamenco insists on an effusive, rich emotional expression, numerous gestures, and the increased expression of emotional experience (Candelori & Diaz, 1998; Vukadinović, 2002; Gómez Muñoz, 2008; Pantoja Guerrero, 2008) and also for some flamenco artists it represents a kind of philosophy of life (Castaño Hervás, 2008).

Based on these results and discussions, we can conclude that the cognitive theory of aesthetic decision making (Ognjenović, 1991, 2003) served not only as a theoretical basis for examining the experience of dance but also it found its application in another artistic field, and that is dance.

It turned out that choreographies can be distinguished by beauty, depending on the aesthetic mode, and that the participants have a dominant preference for the choreographies of R type. The participants prefer flamenco choreographies which are decorated, rich and ornate, so it can be concluded that such preferences may be related by how the stimulus was presented and the level of the participants’ general culture, but also such preferences confirm the basic idea of the art of flamenco.
Capturing Competent, Creative Students to Perform Future Research in Empirical Aesthetics

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Abstract

The courseware used in introductory courses about Cognitive Psychology of Visual Art can capture the interest of promising students and increase comprehension of subject matter. Activities including portfolio projects, demonstrations, and lab studies were used in three classes at two university settings. Portfolio projects were especially valuable for learning. When choosing portfolio projects, students most often selected applications of psychology principles to a self-chosen artwork (e.g., Mark depth cues onto a copy of an artwork) and selected projects based on aesthetic philosophy least often (e.g., Challenge Kant's definition of beauty as "disinterested pleasure"). Most class demonstrations of perceptual and cognitive effects successfully replicated those in the literature (e.g., the size of an illusion varies with context). However, we had only mixed success in replicating aesthetic research findings (e.g., most pleasing rectangle). These pedagogical activities engaged students contributing to positive attitudes toward applications of cognitive neuroscience to art.

Keywords: courseware; introduction to empirical aesthetics; perception; cognition; visual art

Introduction

Good introductory courses about Psychology and Visual Art can capture the interest of promising students. Our teaching experiences suggest that hands-on activities are valuable ways to improve understanding and elicit positive attitudes about applications of experimental psychology to art. We evaluated three activities in our classes: portfolio projects, class demonstrations, and lab studies.

Research about teaching methods in sciences indicates both understanding of course material and attitudes toward the course can be improved. For instance, interactive lecture experiments led to more positive ratings for the course, but passive demonstrations in physics classes did not show increased understanding of principles (Moll & Milner-Bolotin, 2009).

Our students in courses on Psychology and Visual Art hand in portfolio projects for each topic area. And we also present many demonstrations/lab studies. Fortunately, most perceptual and cognitive phenomena such as shape and size constancy can be experienced by each individual and often require minimal equipment. The teacher can readily link these phenomena to artworks and art styles. We present examples here along with some student evaluations.

Methods

Participants

Students in three different courses at two American universities participated (N = 16, 17, 19). All were young adult, full-time students except for two older adults auditing the class. Institutional Review Boards approved these activities and students used a pseudonym or kept their work.

Materials and Procedure

Portfolio projects Students were required to hand in one (or two) portfolio projects for each of 12 topic areas (Table 1). For each topic area, there were 6 to 9 options. Portfolio projects were weighted 20% or 50% in different courses.

Table 1: Portfolio project types and examples.

<table>
<thead>
<tr>
<th>Type</th>
<th>Topic</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>1) Light</td>
<td>1) Describe how brightness constancy works and present an artwork that illustrates it.</td>
</tr>
<tr>
<td>Essay</td>
<td>2) Depth</td>
<td>2) Mark &amp; label depth cues available to a viewer on a copy of an artwork.</td>
</tr>
<tr>
<td>Personal</td>
<td>1) Face</td>
<td>1) Critically review in-group studies of face perception.</td>
</tr>
<tr>
<td></td>
<td>perception</td>
<td>2) Compare symmetry in art from two different cultures?</td>
</tr>
<tr>
<td></td>
<td>2) Aesthetic preferences</td>
<td>1) Make a collage reflecting your life and interests and link it to creativity studies.</td>
</tr>
<tr>
<td></td>
<td>1) Creativity</td>
<td>2) Produce an Op Artwork describing how viewers can perceive motion in it.</td>
</tr>
<tr>
<td>survey or</td>
<td></td>
<td>2) Ask people to view a pointillist picture close &amp; far away; link the findings to</td>
</tr>
<tr>
<td>design</td>
<td></td>
<td></td>
</tr>
<tr>
<td>study</td>
<td>1) Artists &amp; non-artists</td>
<td>2) Make a collage reflecting your life and interests and link it to creativity studies.</td>
</tr>
<tr>
<td></td>
<td>2) Color</td>
<td></td>
</tr>
</tbody>
</table>
Demonstrations & Lab experiments When relevant to the daily subject matter of the classes, demonstrations or lab-class studies were presented. Five examples are described here.

(1) Shepard illusion Students were asked to draw/copy two different pictures to study depth perception. For one group, two unadorned parallelograms appeared side by side with the vertical axis longer on the left and the horizontal axis longer on the right. For the other group, the same parallelograms were incorporated into perspective drawings of tables oriented vertically and horizontally (Figure 1).

![Figure 1: Shepard illusion pictures.](image)

After completing both drawings, students measured the mean length of the short and long sides for each parallelogram. Ratios of long to short sides were used to control for different scales in the drawings.

It was hypothesized that participants would perceive the depth cues from perspective drawings as more discrepant from the linear sizes than the unadorned-parallelogram group (Mitchell, Ropar, Ackroyd & Rajendran, 2005). In other words, perspective cues of implied depth in a picture can elicit greater errors when drawing than flat geometric shapes.

(2) Canonical representations of objects Students were asked to draw a cup and saucer. The demonstration was presented before the class read about object identification or canonical representations of objects. The drawings were photocopied and arranged in a collage. Students were asked to note any similarities in the drawings and these were related to canonical form.

(3) Ponzo illusion and instructions A Ponzo illusion (n.d.) lab was downloaded from Online Psychological Laboratory (OPL) retrieved from http://opl.apa.org/Experiments/Ponzo illusion.aspx. Instructors register their course and receive a password. In our lab study, students accessed OPL and chose the Ponzo illusion, doing two sets of 10 trials. One set consisted of judgments made with an instruction to try to overcome the illusion; and, the other with the instruction to let the illusion happen. Half the class used each instruction first to control for order effects.

In the OPL Ponzo-illusion program, participants adjust the lower of two horizontal lines to match its length to the upper line (Figure 2). On half the trials, a background is present comprised of two converging oblique lines in a Ponzo configuration inducing the illusion of depth, and half the trials have no background. The mean percentage error for each type of background appears immediately after finishing a set of 10 trials and students recorded their data points manually for the two backgrounds and the two types of instructions.

We expected a difference in the horizontal lengths to occur only in the Ponzo context. The size of the illusion was expected to be smaller with the overcome illusion instruction.

![Figure 2: Types of trials in Ponzo lab study](image)

(4) Pleasingness of rectangles Students were given 9 black-paper rectangles, each having 100 cm² area based on Fechner's study (1874/1997). The horizontal to vertical ratios were: 1/1, 1/1.2, 1/1.26, 1/1.35, 1/1.49, 1/1.59, 1/1.77, 1/2, 1/2.5.

Students first chose the most pleasing rectangle; this one was removed, and they chose the most pleasing stimulus that remained. Then, students indicated from the whole set of 9 which rectangle they found the least pleasing. This least pleasing stimulus was removed, and they chose the one they liked the least of the remainder. The principal hypothesis was that the ratio of sides of the most pleasing rectangle would be close to the golden ratio of 1/1.61, and very few of the least pleasing choices would have this ratio.

(5) Meaning in abstract pictures Examples of black-and-white abstract drawings by Japanese art students to express seven different words were scanned into a powerpoint presentation (Takahashi, 1995). The stimulus words were anger, depression, energy, femininity, joy, tranquility, and illness/discomfort. The drawings that had elicited the most communicative agreement for more than 300 non-art savvy students in Japan were shown to an American class (Figure 3 has examples).

Initially students were given no cue words but simply wrote down the emotion or idea represented in the black-and-white slide. Then students were given the list of the seven stimulus words Takahashi (1995) used and they matched the words to the drawings. They had 8 trials because one of the word/images was repeated in the sequence to prevent simply crossing off each word.

One hypothesis was that art will communicate meanings internationally but answers to the open-ended question to identify the word that elicited the picture would vary widely.
Figure 3. Examples of abstract art expressing words "depression", "discomfort", "femininity" & "tranquility" (from top-left) produced by Japanese art students.

Results and Discussion

Portfolio Projects
In an end-of-course evaluation in one class, 75% of respondents mentioned that portfolio projects were a positive aspect of the course in answer to a direct question. Some students requested more class demonstrations and fewer portfolio projects. Several noted the projects were time-consuming to complete.

Grades were significantly higher for Essay portfolio projects than for other types ($F(3, 54) = 3.26, p = 0.03$, partial $\eta^2 = 0.15$, Table 2). This difference may reflect positive bias by teachers toward answers that were supported by empirical studies. The lower grades for personal type projects may indicate students were unaware of the importance of empirical support when presenting personal opinions. The maximum grades did not differ for the four types of portfolio projects.

Table 2: Grades by Portfolio Project Types. "Outstanding" = almost publishable A quality: 94-99%

<table>
<thead>
<tr>
<th>Type</th>
<th>Mean (SD)</th>
<th>grade</th>
<th>Outstanding projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Essay (n = 22)</td>
<td>89.5% (3.8%)</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Conduct survey (n = 6)</td>
<td>88.1% (1.4%)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Application (n = 22)</td>
<td>87.1% (3.1%)</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Personal (n = 8)</td>
<td>86.0% (2.4%)</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Demonstrations & Lab Experiments
(1) Shepard illusion As predicted by Mitchell et al. (2005), the group drawing tables (parallelograms with perspective cues) produced figures more discrepant from the linear size than groups drawing unadorned parallelograms. The direction of errors was as predicted: the upper horizontal lines students perceived to be further away were elongated relative to the lower lines.

The drawings for the tables group differed significantly from the long/short-side ratio of the picture that was copied (2.05). The standing-up figure's (A) ratio was 2.32 and the lying-down figure's (B) ratio was 1.81. These ratios also differed significantly from those of the group drawing the unadorned parallelograms (2.03: A & 2.07: B).

The findings confirmed that perspective cues can alter drawing of simple geometric shapes providing direct evidence that perception is responsible for some differences in drawing ability (Cohen & Bennett, 1997; Mitchell et al., 2005).

(2) Canonical representation of objects Every student drew a side view of a cup, although the quality of drawing varied: some used shading; others put contents in the cup (Figure 4). This replicates the finding of Solso (1994).

The students noticed that all but one drawing had the handle on the right side of the cup (95%); the exception had its handle on the left. They suggested this might be linked to handedness although there was no way to confirm this because the drawings were unsigned.

The demonstration showed clearly that, for American students in this class, a side view is the canonical form for a cup. The view represents the idealized object in memory for these students and probably would be recognized faster as predicted by Palmer, Rosch and Chase (1981). Canonical views may also be important for different art styles (Casco & Guzzon, 2008).

(3) Ponzo illusion and instructions The data set was comprised of error levels indicating the percentage that the top horizontal line appeared to be longer than the lower line for each of the four conditions (Figure 2). A 2 x 2 repeated measures analysis of variance conducted for one class with context (Ponzo background or no background) and instructions (overcome illusion or let it happen) as factors revealed three significant effects (Table 3).
Table 3: Mean error (SD) in length of adjustable line (bottom) relative to fixed line (upper) for Ponzo and control displays with two different instructions.

<table>
<thead>
<tr>
<th>Instruction:</th>
<th>&quot;Overcome illusion&quot;</th>
<th>&quot;Let illusion happen&quot;</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Ponzo)</td>
<td>18% (12%)</td>
<td>33% (12%)</td>
<td>25%</td>
</tr>
<tr>
<td>(control)</td>
<td>5% (6%)</td>
<td>6% (3%)</td>
<td>5%</td>
</tr>
<tr>
<td>Mean</td>
<td>5%</td>
<td>25%</td>
<td></td>
</tr>
</tbody>
</table>

As expected, instructions to overcome the illusion resulted in reduced errors (Table 3, $F(1, 15) = 28.53$, $p < 0.001$, partial $\eta^2 = 0.66$). This illustrates that a cognitive mind-set can influence the extent of the illusion. Making judgments in the Ponzo configuration led to greater error rates than no-background displays, $F(1, 15) = 53.27$, partial $\eta^2 = 0.78$. That is, the expected illusion of depth occurred.

As predicted, the interaction between instructions and type of the background was also significant. Errors rates did not differ when the display had no background, but a substantial difference was found with the Ponzo background, $F(1, 15) = 28.08$, $p < 0.001$, partial $\eta^2 = 0.65$. The overcome-the-illusion instruction reduced the perceived length by almost half compared to the instruction to let the illusion happen in the Ponzo context.

This Ponzo illusion demonstration confirmed that viewers have some cognitive control of the extent of an illusion although the effect remains even when trying to overcome it. This suggests artists have some cognitive control available when producing works in which an illusion of depth or motion is conveyed to the viewer. In some cases, artists must overcome these effects to create a piece. For instance, Brigit Riley reports masking all but a small portion of a composition when producing gratings in some of her Op Artworks (Rich, 2007).

(4) Pleasingness of rectangles According to Fechner (1874/1997) the sides of the most pleasing rectangle have a ratio close to the golden ratio of 1/1.61. In one class, 42% of participants rated the golden rectangle, or the one next to it, as the most or next-most pleasing. In another class, the preference was 56%. These findings are much reduced relative to Fechner’s (1874/1997) result of 75% preference.

In this demonstration, rectangles considered to be least (or next-least) pleasing were unlikely to be the golden rectangle. In one class, 24% identified the golden rectangle as least pleasing, and only 9% in the other.

Generally, this demonstration about aesthetic preferences only roughly confirmed previous research. This is consistent with golden section effects generally: strong preferences are rare and the golden effect is fragile (Green, 1995).

(5) Meaning in abstract pictures For 5 of the 8 pictures, the meaning of the word Takahashi (1995) gave to the Japanese artists was communicated fairly successfully to the American students. That is, they matched the stimulus word more than any other word-options for these 5 pictures. Feminity and tranquility were accurately identified the most (88%, Figure 3 lower panels).

However, some words were often confused such as depression and discomfort/illness. The picture drawn by an artist to represent discomfort/illness in the top-right of Figure 3 was identified by 82% of the students as depression (top-left). And 41% matched the picture of depression to discomfort while only 23% identified it with depression. Anger was also confused with energy and discomfort.

These results indicate that the meanings of abstract art tend to vary despite some uniformity. That is, the demonstration that art can communicate specific meanings was only somewhat successful, not strongly so.

General Discussion and Summary

Students reported that doing portfolio projects and participating in demonstrations during Cognitive Psychology of Visual Art courses were positive aspects of the course. Their course evaluations suggested that many found the hands-on activities captured their interest and were valuable in their understanding of the material although some noted that portfolio projects were time-consuming to produce.

A notable limitation of this poster is that a rigorous study was not conducted comparing classes that had portfolio projects with a control group without projects. Similarly, the value of demonstrations to interest students in the course material was not compared systematically with courses that did not use these methods. Other science research suggests that hands-on demonstrations tend to make the attitudes of students more positive (Moll & Milner-Bolotin, 2009). If these findings generalize to courses on Psychology and Visual Art, then using demonstrations and portfolio projects in courses can be an important step in capturing the interest of potential researchers in empirical aesthetics.

Another limitation about teaching in general has been increasingly encountered in our courses. This is that many 21st Century students rely almost exclusively on internet access for external information. Although the internet enhances some class exercises, reproductions of visual artworks tend to vary considerably in quality and color. Some students seem reluctant, and even hostile, about consulting art history books to see high-quality and accurate reproductions of artworks. This issue is one that needs to be addressed by those teaching Psychology of Visual Art courses.

In summary, teachers can readily use paper-and-pencil and standard audio-visual equipment along with widely available free software to provide demonstrations and lab classes that will enhance their courses. We have found a majority of
students report being engaged intellectually when answering the portfolio questions and participating in demonstrations. Such pedagogical activities may be especially fruitful in attracting competent, creative researchers for future advances in empirical aesthetics.

References
Looking at Abstract and Representational Art

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Abstract
Eye movements often reflect the way attention is deployed across visual stimuli. People with expertise in visual art experience art differently than naïve participants. We tested the hypothesis that some knowledge of art changes how people look at art and produce different gaze patterns. We further investigated the possibility that gaze patterns vary depending on whether the art is representational or abstract. Finally, we tested the hypothesis that ‘an aesthetic gaze’ might be different than other ways of looking at art.

Keywords: representational art; abstract art; art expertise; eye tracking

Introduction
Eye movements often reflect the way attention is deployed across visual objects including artwork. Studying participants’ eye movements can inform models of how individuals view and appraise visual compositions.

According to the two-stage model of picture perception developed by Locher, Nodine, and Krupinski, one’s exploration of a picture begins with a global survey to get the gist followed by a phase of increased visual scrutiny which contributes to one’s aesthetic appreciation (Locher, 2006).

Molnar hypothesized that aesthetic judgments are made during the initial sweep of a painting, and not during later fixations, which are used to satisfy curiosity and explore rather than to decide on preference (Molnar, 1981). When viewing paintings judged by the viewer as having “good compositions,” subjects’ eye movements find equilibrium among the painting faster than when viewing “bad compositions” (Nodine, Locher, & Krupinski, 1993).

Expertise also influences the individual’s aesthetic experience of artwork. Experts “presumably develop representations that are more abstract than those of non-experts” (Augustin & Leder, 2006). In naïve participants, finding meaning in art seems to depend on the level of realism in the art while experts “establish a link between meaning and degree of expressiveness or structure and composition” (Augustin & Leder, 2006). Naïve participants tend to justify their preferences with respect to their personal feelings about the artwork whereas experts justified their preferences in reference to style elements (Augustin & Leder, 2006).

Experts typically prefer abstract art more so than naïve viewers. Knowledge of compositional strategies, stylistic conventions and art practices can influence people’s attention as they engage artwork (Seeley, 2013). Expertise can influence neural response to visual images and enhance response in reward circuitry (Kirk, Skov, Christensen, & Nygaard, 2009) and demonstrate how meaning and knowledge influence aesthetic experiences (Chatterjee & Vartanian, 2014).

Expertise is also associated with different ways of looking at visual art. For example, Nodine, Locher, and Krupinski examined whether art-trained viewers and untrained viewers differed in their perception of balance in artwork and found that untrained viewers focused on central and foreground figures whereas trained viewers focused on relationships between “shapes, colors and space of the compositions, which required scanning of background areas” (1993).

In the present study, we investigated the relationship between art experience and how people look at and appraise different kinds of art. We asked expert and naïve participants...
to make descriptive (color warmth) and evaluative (preference) judgments on representational and abstract artworks. We tested the hypothesis that knowledge of art changes how people look at art and produce different gaze patterns as measured by saccade and fixation numbers. We further investigated the possibility that gaze patterns vary depending on whether the art is representational or abstract. Finally, we tested the hypothesis that ‘an aesthetic gaze’ might be different than other ways of looking at art.

**Methods**

**Participants**

Participants were between the ages of 18 and 32. They were categorized as naïve or expert participants based on their responses to an art experience survey (Chatterjee, Widick, Sternschein, Smith, & Bromberger, 2010). Naïve participants (n=20) recruited from the University of Pennsylvania were required to have minimal art training. Experts (n=20) had taken a combination of studio art classes, art history classes, and aesthetics classes at the high school level or above, in addition to making visual art. Participants had normal or corrected-to-normal vision, and declared they were free of neurological and psychiatric diagnoses. Participants were compensated with either money or course credit.

**Stimuli**

To limit the range of representational and abstract art used, representational art was exemplified by 10 Paul Cézanne paintings, and abstract art by 10 Jackson Pollock paintings. Stimuli included 20 JPEG files of paintings, which were horizontally oriented and normalized for height at 360 pixels. All paintings were gathered from public domain websites.

**Procedure**

First, consent and basic demographic information were obtained. Before performing the task, participants saw all the paintings that were used in the tasks in random order. Then, a Tobii T120 EyeTracker tracked participants’ eye movements at 120 Hz while they viewed 10 abstract paintings by Jackson Pollock and 10 representational paintings by Paul Cézanne. For each painting, participants made evaluative (preference) judgments on a 5-point Likert scale ranging from 1 (“do not like”) to 5 (“really like it”) and descriptive (color warmth) judgments on a 5-point Likert scale ranging from 1 (“no warm colors”) to 5 (“mostly warm colors”). We recorded the number of participants’ visual saccades and fixations over 7 seconds. The Tobii system generated raw eye gaze coordinates. Fixation and saccade number were calculated using a MATLAB algorithm. Fixations were calculated by grouping gaze points into clusters using running mean calculations with a 0.05 fixation radius threshold. Saccades were defined as a distance between two points greater than the fixation radius.

**Results**

**Preference Ratings**

Experts (mean=2.89, SD=0.89) preferred abstract art more than naïve participants (mean=2.37, SD=0.71, t(38)=2.048, p=0.048). There was no significant difference between the preference ratings for representational art between naïve participants and experts (t(38)=0.267, p=0.791). In the descriptive task, there was no difference between expert and naïve ratings of warmth on abstract paintings (t(38)=0.582, p=0.564) or representational paintings (t(38)=1.477, p=0.149).

**Eye Movement**

Repeated measures ANOVA were used to analyze the effects of expertise, painting type, and task type on participants’ fixation number and saccade number (2×2×2, expertise × painting type × task type). Both groups made more saccades when looking at representational paintings (mean=32.75, SD=10.89) than abstract paintings (mean=30.27, SD=10.43; F=11.11; p=0.002). They also had more fixations when looking at representational paintings (mean=24.74, SD=5.59) than abstract paintings (mean=23.12, SD=4.80; F=16.85; p<0.001). Experts (mean=35.98, SD=10.36) made more saccades in the evaluative task than naïve participants (mean=29.06, SD=10.48; F=4.62; p=0.038), but not on the descriptive task.

**Gaze Distribution**

To assess the percentage time individuals spend looking at various sectors of a painting, we chose one representative abstract (Pollock’s *Untitled 3*) and one representative representational painting (*Cézanne’s L’Estaque: View of the Bay of Marseilles*). These paintings were chosen because they had the smallest standard deviation of fixations and saccades within the expert and naïve groups. We divided each painting into 25 equal sectors and calculated the total percent of time spent in each grid (like Locher, Krupinski, Mello-Thoms, & Nodine, 2007). These percentages were converted into a grayscale value and mapped onto a translucent grid that was superimposed on the painting image using Adobe Photoshop. Brighter, whiter grids denote longer looking times; darker grids denote shorter looking times.

Qualitatively, naïve participants (Figure 3) and experts (Figure 7) appeared to spend most time looking in the middle of *Untitled 3* while performing the descriptive task. During the evaluative task, experts’ gaze (Figure 8) seems to be more distributed throughout the painting compared to naïve participants (Figure 4) performing the same task.

Again, there were similarities in gaze distribution between naïve participants (Figure 1) and experts (Figure 5) while they made descriptive judgments on Cézanne’s *L’Estaque*. In the evaluative task, experts (Figure 6) spent more time looking at the left third of the painting relative to naïve participants (Figure 2). While naïve participants had a similar gaze distribution in both the descriptive and evaluative tasks, experts had markedly different distributions between the two tasks.
Figure 1: Cézanne, Descriptive Task, Naïve

Figure 2: Cézanne, Evaluative Task, Naïve

Figure 3: Pollock, Descriptive Task, Naïve

Figure 4: Pollock, Evaluative Task, Naïve

Figure 5: Cézanne, Descriptive Task, Experts

Figure 6: Cézanne, Evaluative Task, Experts

Figure 7: Pollock, Descriptive Task, Experts

Figure 8: Pollock, Evaluative Task, Experts
Discussion

Expert and naïve participants did not differ significantly in their preference ratings of representational art but our experts did rate abstract art higher than naïve participants. This reflects the idea that people can develop taste with training (Chatterjee, 2011) and experience and meaning influences preference perhaps more for abstract than representational art. We also note that our experts were college students and not expert in the way that an art historian, critic, or museum curator is expert. A little education and experience with art can increase the appreciation of abstract art.

Content affects how people visually explore art. All groups made more fixations (on average) on representational art than abstract art. Recognizable objects in representational art probably give viewers foci on which to direct their eye movements and fixations. But it is surprising that there is no difference in fixation and saccade numbers between groups looking at representational versus abstract art. Given that there are no recognizable objects in our chosen abstract paintings and that experts’ gaze is guided by style, we might have expected that naïve participants do not have significantly less fixations than experts.

Experts viewed artworks differently than naïve participants specifically when appraising the artwork, but not when judging its perceptual features. Experts made more saccades than naïve participants when making evaluative judgments suggesting an active exploration of the images. In our qualitative analysis of our gaze distribution plots, experts show different looking patterns when asked to judge color warmth versus preference while naïve participants display similar looking patterns. This suggests that expertise influences gaze patterns specifically when participants are appraising artwork, or that there is such a thing as “an aesthetic gaze” that is captured by patterns of eye movements.

Acknowledgments

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References


PART FOUR: ART EXHIBITION
Gravitational Attraction of Fragments

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Abstract

All the work, from the very beginning, adopts elements of breakthrough. The transience and the ephemeral, the fiction of the preciousness in the illusory abundance and in the fictitious choice are nothing more than the explanation of the condition of the individual. The image wants to live, like searching in a concretist craze to make real the false show. In this obscene comparison, the observer is the only true model of his images, that serving as a place of action and object, in addition to the dynamic apperceptive experiences, focuses on existing relationships, between what you want to believe as art its production processes, its inherently authoritarian dynamics. In this pandemic social domain, it arises a moment of crisis, in which there is no imposed point of view but just accumulation of sensations commodified and non-commodifedable. An all-encompassing anarchic utopia could be defined this claim to the integrity of to image with life and there is not necessarily present a relationship of continuity revealed to the retinas.
Aesthetic Photographic Pictures Based on Assimilation vs. Contrast Phenomena

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Abstract
We try to valorise two formal components favourable to aesthetic experience in the interaction between the beholder and the images, and we are dealing with the process of “Amodal Completion” (Michotte, Thinès & Crabbé, 1967; Bonaiuto 1988), which has frequently been proposed in visual art works, as already noted by Kanizsa (1988). This perceptual effect is opposite to, but sometimes integrates, the opposite illusions called masking effect. It creates a figure-ground process that can highlight object identity or, in different cases, reduce object identity. The series of “texture effects” are based on “screen effects” and produce a masking effect of single elements that are partially assimilated to the background. These perceptual effects of ambiguity enhance aesthetic experience.

Keywords: Aesthetic Appreciation, Completion, Involvement, Perception, Personality.

Antecedents, Purposes and Methods
The height examples I have selected for the IAEA Art Exhibition in New York try to valorise two formal components favourable to aesthetic experience in the interaction between the beholder and the images. We are dealing with the process of “Amodal Completion” (Michotte, Thinès & Crabbé, 1967; Bonaiuto 1988), which has frequently been proposed in visual art works, as already noted by Kanizsa (1988). This perceptual effect is opposite to, but sometimes integrates, the opposite illusions called masking effect. It creates a figure-ground process that can highlight object identity or, in different cases, reduce object identity.

The process of Amodal Completion allows increasing two factors of aesthetic experience, and namely originality, due to the close-up and thus rather unusual shots of the objects depicted, and beholder involvement. As demonstrated in some specific experimental studies (Biasi & Bonaiuto, 2008), the more intense the perceptual completion process, the stronger the corresponding need for completion. This makes the beholder more involved in the process of confirmation of the mental schema activated.

The series of “texture effects” are based on “screen effects” and produce a special process of masking of single elements that are partially assimilated to the background. These perceptual effects enhance aesthetic experience due to the increased ambiguity.

In this regard, we can examine Fig. 1 (a, b).

Fig. 1 – Figural situations favorable to the assimilation effect (a) and to the contrast effect (b) (Bonaiuto, 1965, 1969).
We recall that two elements of the phenomenological field, if cohesive in that, for example, they are close to one another, they influence each other and tend to increase their apparent similarity, in the case that their structural unitariness is guaranteed; or produce an increase in their differences, at the phenomenal level, if the perceptual structure is characterized by contraposition, multiplicity and heterogeneity of aspects.

While in (a) there prevails the unitariness of the overall structure and it is favorable to shape assimilation, for which the circle also tends to appear as a slightly vertical ellipse, in the second case (b) the spatial proximity, indeed the concentricity of the circle and of the ellipse, along with the great number of the latter that are contraposed to the circle, favour the contrast effect which is the first step, the basic situation, so that a conflict is developed at the perceptual level.

A light assimilation is present in case of textures (based on the completion effect). A strong contrast between figure and background is present in “Prominence effects”.

The height colour pictures I am presenting, with psychological remarks, have been obtained by using a SONY Cyber-Shot DSC-H50 digital camera. They can be listed as follows:

1) “The Stones, No. 1” (Valeria Biasi, 2013; 50x35 cm).

The stones appear to extend well beyond the margins of the image, and to cover each other, giving rise to a “texture effect” based on a “screen effect”, and produce a special process of masking of single elements that are partially assimilated to the background.

2) “The Stones, No. 2” (Valeria Biasi, 2013; 50x35 cm).

A second example. The psychological remarks are as for those above.

3) “Dry Textures” (Valeria Biasi, 2013; 50x35 cm).

Flowers and leaves appear to extend well beyond the margins of the image, and to cover each other, giving rise to a series of “textures effects” and of “screen effects”.
4) “Green Textures” (Valeria Biasi, 2013; 50x35 cm).

Fig. 4

A second example of floral texture. The psychological remarks are as for those above.

5) “Flowers, No. 1” (Valeria Biasi, 2013; 50x35 cm).

Fig. 5

The psychological remarks are centered on “Prominence effects” produced by a strong contrast between figure and background.

6) “Flowers, No. 2” (Valeria Biasi, 2008; cm 50x35). A second example.

Fig. 6

7) “Flowers, No. 3” (Valeria Biasi, 2013; 50x35 cm). A third example.

Fig. 7
References


The psychological remarks are centered again on contrast effect.

Fig. 8

8) “Fruits” (Valeria Biasi, 2013; 50x35 cm).
Four Lithographs Based On Illusory Contours, Colours and Meaning Differences

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Abstract

In the history of arts there are examples of the use of shadows to obtain aesthetic effects. In the tradition of experiments on illusory contours, we know the efficacy of depicted own shadows (chiaroscuro) in order to obtain the appearance of letters, numbers and other bodies (Jastrow, 1989; Metzger, 1953; Bonaiuto, Giannini & Bonaiuto, 1988, 1991). Moreover, illusory contours, surfaces and volumes have been obtained by using cast shadows (Bonaiuto, 2004) in relationships with their apparent causal agents. My drawings are first outlined in pencil on paper, and then the boards are completed by using China ink and photostatic reproduction, with addition of colours. In addition, I depicted the effect of meaning attribution of phenomenal importance of the represented object.

Keywords: Aesthetic Appreciation, Completion, Involvement, Perception, Personality.

Antecedents, Purposes and Methods

In the history of arts there are examples of the use of shadows to obtain aesthetic effects. In the tradition of experiments on illusory contours, we know the efficacy of depicted own shadows (chiaroscuro) in order to obtain the appearance of letters, numbers and other bodies (Jastrow, 1989; Brunswik, 1935; Metzger, 1953; Coren, 1972 and Bonaiuto, Giannini & Bonaiuto, 1988, 1991). Moreover, illusory contours, surfaces and volumes have been obtained by using cast shadows (Bonaiuto, 2004) in relationships with their apparent causal agents (Litogragraphs 1 and 2). My drawings are first outlined in pencil on paper, and then the boards are completed by using China ink and photostatic reproduction, with addition of colours.

Computerised comparative evaluations of graphic density and clarity of the illusory effects are then made with evaluation scales. It is important to exactly match the graphic density in the drawings to be compared with one another because, if this variable is not balanced out, more evident illusory contours can arise for the very intensity. The evaluations of clarity by subjective scales enable us to control the real attainment of the hallucinatory effects.

In addition, I represented the graphic illustrations of some humorous or Vatican historical characters (Lithographs 3 and 4). In some sense, I try to depict the effect of meaning attribution of phenomenal importance of the represented object.

Different conditions favour illusory patterns (Petry & Mejer, 1985), like shadow depictions, amodal completion, cause-effect illustrations, etc. Among relevant variables, we valorised semantic components: the meanings attributing importance to personages and objects.

We also studied the role of incongruity intolerance. In the past, we presented the criteria, depictions and results of many experiments conducted using illustrations of men and women with elegant vs. shabby appearance, or integral or deteriorated objects of use. Illusory clarity was evaluated with 11-point scales. Importance levels and other physiognomic features required 7-point bipolar scales. The opposing depictions were equalised for mean graphic density (Adobe Photoshop CS program). Participants were both gender adults, individually examined with appropriate precautions, including double blindness. The Building Inclination Test was used for assessing incongruity intolerance levels (Bonaiuto, Giannini & Bonaiuto, 1990; Bonaiuto, Biasi & Giannini, 2006).

Visual clarity of illusory patterns was significantly higher with elegant figures or with those whose phenomenal importance was anyway guaranteed by value indicators. Interaction with incongruity intolerance levels was significant, showing that these phenomena aim to reduce or avoid bothersome incongruities.

The lithographs presented here in New York are the following:
1) “Men Shadows and Hurdles” (Paolo Bonaiuto, 2013; 50x70 cm)

This lithograph, entitled “Men Shadows and Hurdles”, presents a group of athletes running towards a barrier of hurdles. These are created by the very shadows of the athletes and determine the characteristic Illusory Contours.

2) “An International Sport Competition among Women” (Paolo Bonaiuto, 2013; 50x70 cm)

This second lithograph, entitled “An International Sport Competition among Women”, derives from the first one. It represents a group of women athletes, distinguished by the colour of skin and shirt, according to their nationalities. This lithograph was inspired by the recent World Athletic Championship held in Moscow (Russia).

3) “Goliardic Papyrus” (Paolo Bonaiuto, 2013; 50x70 cm)
The third lithograph is entitled "Goliardic Papyrus". There is a goliardic tradition at the University of Bologna, according to which the first-year students (the so-called "Freshmen") had to be equipped with an unofficial document called a "Papyrus", also accompanied by the so-called "Codicils" and issued by any group of older students, such as the so-called "Beans" (second year students) and the "Seniors" (students of later years). This goliardic document allows a Freshmen to move adjacent to the University overcoming any requests for packets of cigarettes or food from other "Seniors" who may be encountered. The same delivery of the "Papyrus" and "Codicils" involves the payment of a benefit in kind to the promoter group, still in the form of cigarettes or a dinner.

Following tradition, each "Papyrus" is written on both sides and contains ritual phrases in Macaronic Latin, indicating the name of the student and the Faculty of registration, symbolic numbers, holes made with a lighted cigarette, possible obscene depictions and whatever.

In my case, I produced one of these "Papyri" for a friend, a young student registered in the first year of the Faculty of Pharmacy, Teresa Lombardo, obviously defined in the document as "Teresa de Lombardoana Gente." The color illustrations produced on both sides of a surface of 20 x 26 cm constitute an example of humorous graphics.

The first side, the one containing the name and dedication, has the crest of the city of Bologna at the top with the double Latin inscription "Libertas" ("Freedom") and with the motto "Bonomia Docet" ("Bologna teaches"). In the top right there is a symbolic drawing reproducing a green colored goliardic hat (the color of the Faculty) and also a known symbol, formed by a glass with a snake coiled around it. The other colored drawings that fill the side depict many donkeys climbing the famous "Two Towers" of Bologna. On the right, where there should be the Fountain of Neptune, there is a caricature of this fountain with a character holding salami, sausages and other supplies typical of Bologna, and yielding a large fork bearing a skewered large tortellini: these gastronomic symbols still refer to Bologna, which, as we know, is famously called "La Grassa" ("The Fat") as well as "La Dotta" ("The Erudite").

The other side, with its polychromies is dedicated, above all, to a praise of wine, from a title block above that recites "Vinun Pharmacus Maximum" ("Wine Maximum Medicine"). Below there is pharmacy counter with other symbols, including a container with a cheerful and ruddy face, with the words "Vinum" ("Wine"), while the other presents a symbol of death (skull and crossbones) and the word "Aqua!" ("Water").

Here and there are symbolic numbers, as six and thirty, twenty-three, thirty-three, and five holes with a lighted cigarette.

This lithograph is relevant for the appropriate use of shapes and colour within humorous graphics and for good social communication.

4) The fourth lithograph is entitled “Rome 2014: USA President Obama visiting Pope Francesco”. There is a representation also of Vatican characters (Paolo Bonaiuto, 2043; 50x70 cm)

The lithograph depicts US President Barak Obama together with the current Pope, a cardinal and five members of the Papal Swiss Guards, with their characteristic multicolor vertically striped uniforms. This is the off-duty uniform, different from the official one which also has a metal cuirass bearing the arms of the Della Rovere family, since it was Pope Giulio Della Rovere who founded the corps of Swiss Guards in 1506. The reason for this decision was the proverbial technical precision of the Swiss along with their loyalty. Together with the cuirass, there is normally a helmet (or morion) with a red plume: this helmet is replaced by a black beret when off duty. The shoes are also black.

Some say that this uniform was designed by Michelangelo; others say by Raphael. These views probably reflect the desire to link the uniform to the great artists of the Renaissance – as if to lend a certain nobility to the garments themselves. These uniforms stand out, are immediately visible and contribute to giving a sense of belonging and role. Even the colors distinguish these guards – in stark contrast with the style of attire of ordinary men.
References


Credo: Documentary Photographs of Signs Following Believers

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Abstract

Credo, is a simple declaration of faith unqualified and the title for photographs that explore the experiences of two small congregations who call themselves Signs Followers. Signs Followers base their practices on Mark 16: 17-18 (KJV):

And these signs shall follow them that believe: In my name shall they cast out devils; they shall speak with new tongues; they shall take up serpents; and if they drink any deadly thing it shall not hurt them; they shall lay hands on the sick, and they shall recover.

Worship is characterized by passionate intensity, expressionistic preaching, ecstatic singing, dancing, and the practices described in Mark 16, including healing by “laying on hands,” handling fire, drinking poison, and most distinctively, handling poisonous serpents.

Keywords: Serpent Handling, Signs Following, non-traditional religions

Artist’s Statement

Credo. “I believe” is a simple, powerful declaration of faith without reservation and the title for a series of ethnographic photographs that explore the experiences of two small congregations of believers, who call themselves Signs Followers, in the Appalachian Mountains. Signs Followers base their religious practices on Mark 16: 17-18 (KJV):

And these signs shall follow them that believe: In my name shall they cast out devils; they shall speak with new tongues; they shall take up serpents; and if they drink any deadly thing it shall not hurt them; they shall lay hands on the sick, and they shall recover.

Worship services are characterized by intensity and passion with expressionistic preaching, ecstatic singing, dancing, and the practices described in Mark 16. Their worship often includes healing by “laying on hands,” handling fire, drinking poison, and the most distinctive practice, handling poisonous serpents.

Some believers take up serpents only under certain conditions—the handler must have entered an ecstatic state called “anointment.” Those who have experienced anointment often describe it as “God moving on me.” Believers who handle serpents without experiencing anointment are said to handle “on faith” alone and are thought to be at greater risk of snakebite. The act of handling serpents is not viewed as a test of faith or of God’s grace, but rather as a willingness to place one’s life in God’s hands according to the literal interpretation of God’s word in Mark 16. Although serpent handlers often say, “God gave us victory over serpents” when they handle the snake without being bitten, they are very much aware that a bite from the poisonous snake is not only possible; it may be fatal.

Since the early 1920s, over ninety Signs Followers in the U.S. are known to have died from poisonous snakebites received during religious services; nine others have died from drinking poison (Hood and Williamson, 2008). Because of these practices, law enforcement officers, the courts, and the media have portrayed Signs Followers as demented, dangerous zealots and have sensationalized their practices, especially serpent handling. It should be noted that there might be many more unreported deaths since many congregations of Signs Followers are marginalized, isolated, and interact cautiously with the world outside.

Historian Deborah V. McCauley, writing in Appalachian Mountain Religion: A History (1995), notes that these forms of worship still practiced in the southern highlands are among the very few uniquely American forms of Protestantism. Today, Signs Followers occupy a prominent place among the diminishing number of believers who challenge the dominant religious culture. Signs Followers exist on the far margins of American religious life, yet resolutely maintain their cultural and spiritual identity through their distinctive art, music, language, and worship practices.

In Varieties of Religious Experience (1902), William James defined religion as “... the belief that there is an unseen order and that our supreme good lies in harmoniously adjusting ourselves thereto.” Consistent with this definition, Signs Followers profess passionate faith and dramatically demonstrate it as prescribed in the King James Version of the Bible. Of relevance to the marginal socio-economic status of most Sign Followers, James also warned against “... the assumption that spiritual value is undone of lowly origin.”

Historically, the regard of the mainstream denominations toward Signs Following has been much less liberal than that of William James. McCauley (1995) quotes Ellen Myers, a 19th century mainstream Protestant missionary who reported to her sponsors, “Unless these people have help, they will prove a fretting leprosy in our nation.” Despite the American tradition of valuing religious liberty, this attitude persists.

For over 12 years, I have been documenting two congregations, one composed mostly of older men and women, while the second includes predominantly young people. This is surprising to many in the mainstream, who regard the practices of the Signs Followers as aberrations from the past that must surely be dying out with the advance of modern culture. This is not the case: younger Signs Followers have Face Book pages, websites, cell phones, use email, and play rock-style gospel on electric guitars. Some even have had a reality TV show. During my work with the Signs Followers, I found them to be authentic, independent
people who are committed to their religious traditions and deeply embedded in the rich culture of the southern Appalachian highlands. The preacher of the older, more traditional congregation possesses a profound spirituality and a magisterial knowledge of his historical and religious origins. He produces artworks inspired by his faith and writes about his prophetic dreams, the history of the serpent handling tradition, and of other practices, including incongruously, cock fighting.

There are interesting parallels between outsider religion and outsider art. There are intriguing theoretical, practical, and visual parallels between aesthetic experience and the intense, emotional religious experiences, which Signs Followers call “anointment.”

My work as a documentary photographer is rooted in my academic training in both photography and in the psychology of art. My work combines methodologies of ethnography and documentary photography. My primary interest is in making images that convey the lived experiences of real people, in real time, in a real place, doing real things that are meaningful to them. I never orchestrate the activities of my subjects, and I work among them with their consent. I work to make images that, although they are subjective reflections of finite moments, serve as texts that embody universal human experiences, or least fragments of them. I value any formal aesthetic appeal in my work, but my goal of capturing the immediacy of people’s lived realities supersedes art’s time-honored goal of producing conventionally composed, gorgeous, and easily-read photographs that ensure mass appeal.

A low-res selection of the 40 Credo photographs is attached. The entire series is available at www.rickcaryart.com. Each archival pigment print (digital) is 13 1/2” x 19 1/2” and matted and framed to 20” x 24”.

References
Gender Development

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Creation Statement:
2008  130 x 90 cm  Computer Painting

This work uses Chinese cultural codes like “left side for man, and right side for woman”, “stereotype of gender colors”, and “general code of arrows” to create the concept of “gender development”. The author manipulates her teaching document records and photos to express the power and importance of teaching gender equality.

The form of the artwork is a process of documentation. The power of the students’ works represents the bullets trying to destroy the traditional system of inequality. The action is effective and is hard to ignore.
Woven Faces Project

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Abstract

In my work I explore the sensuality of the woven image and the embodied emotional connection to memories of touch and cloth. I use a digital hand loom to weave images (of faces) that are embedded in the structure of cloth. The digital pixel becomes a thread that when interlaced with another becomes both cloth and image at the same time. What does the discovery of the tactile woven structure and the intense desire to touch the work add to our emotional response to seeing a face? My most recent work investigates the nature of this emotional response to woven faces in collaboration with neuroscientists using both the process and tools of the laboratory as well as direct behavioral studies.

Keywords: Emotion; Faces; Neuroscience research; Woven; Touch.

Woven Faces Project

In my work I explore the sensuality of the woven image and the embodied emotional connection to memories of touch and cloth.

I use a digital hand loom to weave images (of faces) that are embedded in the structure of cloth. The digital pixel becomes a thread that when interlaced with another becomes both cloth and image at the same time. I am particularly interested in the threshold at which the face image dissolves first into pattern and finally into a sensual tactile woven structure. What does this discovery and the resulting intense desire to touch the work add to our already innate, almost automatic emotional response to seeing a face?

My most recent work investigates the nature of this emotional response to woven faces in collaboration with neuroscientists using both the process and tools of the laboratory as well as direct behavioral studies.

Originally, during a traveling exhibition of my work I received very emotional responses to the work. I felt that these responses, although anecdotal, were more intense and emotional that if they had been photographic prints of the faces. It was my idea that the woven nature of the images had something to do with the increased intensity and emotionality.

I first worked with Greg Siegle at the University of Pittsburgh School of Medicine as an artist-in-residence to explore the nature of these responses through a variety of tools: EEG. Eye tracking, pupil dilation, fMRI. This was only preliminary experimentation with one or two subjects but I received enough feedback that I wanted to pursue the question of intensity and emotional response to woven faces in more depth.

Working with Daniela Schiller and her emotion research laboratory, Schiller Lab, at MSSM (Mount Sinai School of Medicine) we used a series of processes and compared a variety of woven faces with photographic prints of similar but different faces to try to understand the difference in emotional response. The studies involved a significant number of subjects.

I conducted behavioral studies within my traveling exhibitions themselves in which I set up separate rooms each with a large woven or photo image respectively and asked the participants questions regarding their response to each. The data from these responses is in the process of being analyzed. However preliminary results of intensity and positivity scales are incorporated into my work through data visualization.

I collaborated with Joann Peck, University of Wisconsin-Madison, School of Business and who does her own research around the subject of touch. We set up a study within my exhibition at Madison, with written responses. We set up 3 booths and asked the viewer to look at distance, close up, and then touch the artwork. We wanted particularly to discover what happened when the viewer was asked to actually touch the artwork...to explore the "intense desire to touch" that the audience feels in response to woven artwork of any kind but in this case faces.

In each of these collaborations, I took process videos of the investigations both to review the process and to occasionally incorporate something of the process into my woven artwork.

Sometimes the unexpected happened such as a chance opportunity to get my brain imaged at the Walter Schneider Lab at University Pittsburgh School Medical for DSI Diffusion Spectrum Imaging. DSI is a detailed MRI of the structure of the neuronal connections between different parts of the brain through the white matter. These structures have the visual appearance of a weave, and images taken were incorporated into my work. An animated video was produced combining these "fiber tracts" with a series woven faces based on a single image.

I continue to want answers my questions about the nature of the emotional response to woven faces through scientifically set up full experiments. At the same time I make artistic work based my own response to the process. The actual studies on which the artwork was based were experimental and preliminary, not ready yet for formal scientific presentation.

The 5 works attached are some examples of recent work that I have done in in response to these investigations.
1. Facing Touch
A weaving of a subject wearing EEG head gear to record brain waves while touching a woven artwork itself. The imagery in this weaving is taken from a video still of the process in the laboratory.

2. Mona Lia
An artwork that uses Diffusion Spectrum Imaging (DSI) of the "fiber tracts" in the white matter of my brain combined with a photograph of myself as a young woman. Here I am using the structural neural connections between part of the brain, integrating these neural "fiber tracts" with the actual fiber connection that make up the woven translation of an image.

3. Intensity Su Data
Draws on visualized data collected from behavioral studies conducted within the exhibition space itself. A woven face was compared to a photographic print of the same face. The viewer was asked to observe the works individually in 2 separate spaces and to respond to 2 questionnaires. This woven artwork combines intensity ratings with the images being viewed.

4. Su Series
A series of woven pieces each one uses same image of a face but each one is translated (woven) differently. Each one seems to project a different emotional state. The picture illustrated here represent an installation of 15 individual pieces. This is a work in process. The final installation will be a wall consisting of approximately 80-100 pieces.

5. Su Brain Tracts- Video
This video is an animation using the pieces from the Su Series combined with moving images of the DSI "fiber tracks". What you see here is a single still from the Su Brain video.
1. Facing Touch 54" x 51"
2. Mona Lia  83" x 51 "
3. Intensity Su Data  52 x 39"
4. Su Series (Wall)

5. Su Brain- video still
Contrasts

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Abstract

I selected six photographic color pictures illustrating several examples of contrasts by means of a Sony digital camera. Some of these contrasts are colour contrasts, for example, between white and grey or green; other examples are centered on contrasts between the character of a living organism and hard inanimate objects. I present examples of contrasts between architectural elements and human beings or animals, or the case of dimensional contrast, or the contrast between different natural elements, or the contrast between movement and the static condition. In conclusion, we find that the many contrasts assure multiplicity while the repetition of the concept of contrast assures unity, that is, we have unity in variety, which is one of the conditions of aesthetic experience.

Keywords: Aesthetic Appreciation, Conflict, Perception

Antecedents, Purposes and Methods

For the IAEA Art Exhibition 2014 included in the IAEA Conference in New York, I selected six photographics color pictures illustrating several examples of contrasts. For these pictures I used a Sony digital camera.

1) Picture No. 1. (Daria D’Aloise, 2014; 50x35 cm).

The image represents a white bird on the marble and cement steps of an entrance. We can see the contrast between the white color of the dove and the gray of the steps and the green of the plants. In effect, we see an animal, plants and inanimate objects: the contrast between the character of a living organism and hard inanimate objects.

2) Picture No. 2. (Daria D’Aloise, 2014; 50x35 cm).

The steps form a perspective view consisting of oblique surfaces that are regularized by the beholder, and are perceived as surfaces closer to or farther away from the beholder, also contributing in this way to the perspective effect. The image represents two cats on a stone stairway of an alley. Still more clearly so, with respect to the previous image, we can see the contrast between kittens, as living beings, and hard stone.

3) Picture No. 3. (Daria D’Aloise, 2014; 50x35 cm).

The image shows two women sitting on a stone bench next to a building. We can see the contrast between the movement of people and the stillness of the building. The presence of these two people lends a note of vitality to the environment, which is also characterized by a closed door and a window closed by an iron grate. The closed door and window are also a sign of the difficulty in entering the building, and the two women are as if excluded from the possibility of getting in.
The two women are sitting in a relaxed position and are chatting, thereby contributing to animating this moment of encounter.

Here, too, the surfaces of the steps contribute to the perspective effect.

Closer than the steps we see a series of cobblestones, the typical ancient paving of Roman streets: these are small blocks of leucitite which were first used for paving Saint Peter’s square and several adjacent streets. This kind of paving is also a sign of lasting past habits which are no longer maintained today. It is said that even Michelangelo, the famous sculptor, worked on making these small blocks of hard stone useful for road surfaces. In today’s Rome, in many places the cobblestones have been replaced by asphalt.

5) Picture No. 5. (Daria D’Aloise, 2014; 50x35 cm).

The image shows a man from behind, sitting on the sea shore.

We can see the contrast between the living being and inanimate objects.

There is also a contrast between the sea and the sky overhead, animated by the light of the sunset and the flight of some seagulls. The colours of this image have a warmth that contrasts with, for example, the cold aspect of the stone in images 1, 2 and 3.

There is also a contrast between the static nature of the man sitting still, absorbed in contemplation, and the mobility of the waves and of the ship moving away.

4) Picture No. 4. (Daria D’Aloise, 2014; 50x35 cm).

The image represents a half-open door with a cat curled upon a stone step.

We can see the contrast between the cat and the inanimate elements (gates, stairs).

The door is ajar, indicating the possibility of entering the dark interior.
We can see the dimensional and chromatic contrast between the two elements. The gravel appears composed of small elements similar to one another but, at the same time, having slight differences in shape, size and color that create an analogy with the condition of human beings who belong to a single category, but who are also intimately different from one another. The large central stone provides stability and equilibrium to the whole image.

In conclusion, we find that the many contrasts assure multiplicity while the repetition of the concept of contrast assures unity, that is, we have unity in variety, which is one of the conditions of aesthetic experience.

References

The Tautology of Virtual Reality - Becoming the Third Person Perspective

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Abstract

It would normally be considered that ‘virtual reality’ is an oxymoron. If however we look at this from a completely different angle, we could consider that they, the virtual and the real, are different aspects of the one thing, that one cannot exist without the other, and that they are complementary, rather than opposing concepts. Therefore ‘virtual reality’ could be described as a tautology, a grammatical figure often used to reinforce the noun described by the adjective - and so it is here because as completely opposing concepts, they create each other by being. These artworks propose that it is the synthesis of diametrically opposed views that enables an evolutionary perspective, and paradoxically, that it takes this perspective to synthesize these views.

Keywords: virtuality; reality; consciousness; perception; intuition; psychology of art

General Introduction

Through my practice as an artist I am exploring a universal principal that explains transformation - the unity of opposites. My foundational practice with the medium of video and projections created an interest in the phenomenology of light, (particularly the visible spectrum) and in different states of consciousness.

My focus is now concentrated on the medium of painting, and it is through this medium that I have been able to explore these areas with a greater level of depth.

Via a combination of practical and analytical research into the concepts of dualism and polarity and exploring the physics of mirroring, I have created the basis of a visual language of which the most fundamental element is the use of a transparent support. This material not only enables me to come closer to materially realizing my sensory perceptions, but to also visually articulate the thoughts and concepts I have on consciousness and reality.

Art Practice

It was via the practical aspect of my work that I was led to discover, what I was later to understand as the concept of the unity of opposites. This concept states that both sides are really different aspects of the one thing, one cannot exist without the other, and so in fact they are complementary rather than opposing forces. It is the ability to understand and utilize both perspectives, the reflection and the reflected, that gives the evolutionary perspective.

Conceptual art is generally considered to be art in which the concept or idea involved takes precedence over aesthetic concerns – “the idea becomes a machine that makes the art”. My methodology is the inverse practice of this, using the intuitive rather than the intellectual as the initial driver, so that in the practice the ‘aesthetic’ of the work takes precedence over ideas. Paradoxically in surrendering to this ‘intuition’, it seems the intellectual mind is permitted to work at a deeper and more authentic level. The intuitive practice leads in the conceptualization of the work, however an analysis of that ‘intuition’ follows - and so on in a circular motion. So, for me ‘the art becomes the machine that makes the idea’.

Initially all my experiments were in two-dimensional thinking in the sense that in 2D there is a line of symmetry and in 3D a plane of symmetry, (see examples of experiments in 2 dimensional thinking: Fig. 1, Fig. 2 and Fig. 3) until I could ‘see’ that it was simply my use of a transparent support that denotes that there are two sides. The transparency enables the viewer to see the painting as you would in a mirror - a front-back reversal, along the depth axis. (I always present the work to the viewer on the opposite side to that which I have painted on). It was this realization that made me see that the concept of dualism, the concept that indicates that there are two forces, could be understood as the concept of polarity, one force with two poles. Two sides of a painting = duality, however, there is only one painting = polarity.

One views the presented side of the work as the ‘right’ side, or the only side, because this how we know how to ‘see’ a painting - it is a conditioned way of ‘seeing’. Interestingly, my choice initially to use a transparent support was, consciously at least, driven only by intuition and aesthetic concerns, and so I too was not conscious of my own conditioning - it took the analysis and synthesis of the practical exploration to realize the ‘solution’ I was seeking, was in a way, also seeking my self.

Artworks

Title: The Tautology of Virtual Reality

If we know it be true that the ‘real’ world is ‘outside’ of what we see ‘inside’ the mirror (in a sense that one knows that ‘the world’ inside the mirror is not ‘real’), it follows then that when one paints, we could say one is doing so in the ‘real’ world.

If one then paints on one side of a transparent plane of symmetry, one - anyone, is then able to look at the ‘other’

side of that plane and see the painting back to front. Therefore, in a conceptual sense, is one not inside the mirror when looking at this painting to the contrary of how it was created?

The work puts the spectator inside the mirror, a position in which one is able to consider that there is a world ‘unreal’, or at least to consider that there are two sides of the world one considers to be ‘real’. Of course, the spectator will only be able to perceive the work as they now how, however, it is the transparency ‘between’ the two sides that permits the opening to the possibility that the side one considers to be ‘real’, is not necessarily so. Each ‘position’ has its ‘mirror’, and it is the ability to understand and utilize both perspectives, the reflection and the reflected, that one can attain an evolutionary perspective. (Fig. 4)

Title: Becoming The Third Person Perspective

The ‘higher’ perspective enabled by the synthesis of opposites I refer to as the ‘third person perspective’. This work - ‘Becoming the third person perspective’ is a visual articulation of this ‘viewpoint’, and it was the becoming (or coming to) this perspective via the practice, that resulted in the work itself. The process of creation enabled the final result, which seems obvious when one is referring to the object, however maybe less so when one is referring to the artist that created it. It was the process that enabled not only the understanding of the concept, but also the access to the different perspective.

In grammatical terms, the first person and third person refer to different perspectives or ‘points of view’ of the subject. The subject is always, independent of which language is being spoken, the person, place, thing, or idea that is doing or being something. The subject performs the verb, whereas the object is defined as the entity that is acted upon by the subject, or indirectly affected by the action of the subject. Of course an object can and does have different perspectives too, but by having this perspective it is being, so it then of course is not the object anymore, but the subject.

The first person perspective refers to the self - ‘I am’. It is the perspective of the person, place, thing, or idea being or doing something. There is also of course the case of reflexivity in the grammatical sense, where one is the subject and the object, for example “I see myself” (“I” and “myself” denoting the same person).

The third person perspective however refers to what is other than the self - ‘he/ she/ it is’. It is the perspective of the person, place, thing or idea outside of, and ‘therefore’ not applicable to the self.

As one can see, the subject always has the first person perspective, even in reflexivity. ‘I am’ myself. The self is only ever able to be self referential or self reflexive in the first person. The self being reflexive in the first person, is still subjective. The self acting on the self with an objective or higher perspective is a different matter – and to arrive here one must find the self as the subject, but in the third person. This perspective is one that interestingly does not have a grammatically correct counterpart, but it is I believe an ability the self can develop, the ability to take the third person perspective - the ‘I is’.

The final visual articulation of this work presented itself when the three pieces it is made of came together, creating one integrated piece. It is via the support being transparent that the integration happens and the work ‘merges’ into one piece. I could then ‘see’ the trinitarian aspect of consciousness, creating, but also coming from, a completely different perspective. This visual articulation then ‘shows’ the synthesis of opposing states enabling a higher or evolutionary perspective, and paradoxically, that it takes this higher perspective to synthesize these seemingly opposing view.

The key, or ‘way in’ to this higher perspective was also ‘shown’. The three planes of symmetry integrated so that I perceived the piece as a four-planed grid, with a horizontal and vertical axis, crossing at the central point. For me this sign has always been a visual metaphor of consciousness aligned in the moment - the ‘being axis’ crossing the ‘time axis’ - it is via this precise point of complete awareness that one is able to ‘move up’ and access the third person perspective - the ‘I is’. (Fig. 5)

Acknowledgments

Special acknowledgements to my Supervisor and Professor of Psychology of Art, Roberto Galeotti and to my Professor of Painting, Italo Bressan.
Figures

Figure 1: one from two.
Figure 2: two on one.
Figure 3: 3D from the two on ones.

Figure 4: The tautology of virtual reality, 2013
Plasticizer, pigments on Polymethylmethacrylate
1 panel. 50cmx100cm

Figure 5: Becoming the third person perspective, 2013
Plasticizer, alkyd enamel, pigments on Polymethylmethacrylate
3 panels. 100cmx100cm
How Abstract is Abstract Art?
A Personal Encounter
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Abstract

Abstract art is rarely so abstract as to completely hide shapes and details that could be recognized as being similar to a familiar object. These are cases of particular perception that bring to mind—consciously or unconsciously—past experiences. With my own watercolors I hope to produce works that demand a double view: the first being the abstract; the second, the “representational,” which, however, should not dominate the overall impression of the painting. Both coloristic and linearistic, my watercolors express my subjectivity and also my desire to attain luminosity. Moreover, I look for harmony between form and color: that is, for an overall “togetherness” inclusive of the different components of a painting.

Keywords: Abstract Art; perception; watercolors; luminosity.

Abstract art is not always so abstract as to hide shapes that sometimes assume contours recognizable by the eye as being similar to, or a reminder of, a familiar object—shapes that can resemble or suggest the rough outlines of human beings or parts of a human body, such as a head or an arm. Sometimes when I take a second look at my watercolor in progress, which I consider abstract, I can see or recognize shapes that resemble something we all know from experience. These are cases of particular perception that bring to mind—consciously or unconsciously—past experiences. That is why, before the initial brush stroke that will result in a finished painting, I think invariably of what exactly I want to attain—a work that demands a double view: the first, and most important, being the abstract view; the second being the “representational” view, which, however, should not dominate the overall impression.

Am I speaking, then, of shapes that carry with them a symbolic meaning? I do not exclude this possibility, but this is not what I intend to achieve. Symbolic art, dominated by symbols, is in my view something of the past, or at least it is an art that has been “refuted” by the important movement of conceptual art.

The question that I pose, then, is whether one can avoid the two conceptions of art just mentioned, symbolic and conceptual, and explore a third possibility: My works are both coloristic and linearistic, and with such a combination I hope to reach a point at which subjectivity comes to the fore. It is a subjectivity that wants to have an impact on the viewers thanks to a combination of colors and curvilinear lines crossing each other.

Moreover, when I paint, one of my purposes is to attain luminosity, so the colors I employ play a prominent role. Colors without the support of different shapes would lose their appeal, or at least would be easily forgotten and leave only a passing glimpsed impression in the mind of the observer, for color alone does not add to the overall Gestalt of a painting. With a drawing, however, the situation changes as there are mainly only black and white lines, with the addition of shading and sfumato. The question now is whether we can also have sfumato with colors, and the answer is “Yes.” In a watercolor we can dilute the colors with water and distribute them to obtain effects that would otherwise only be in our imagination.

What more do I desire from a watercolor beside colors? I want to reach a kind of harmony between form and color. By “harmony” I mean an overall “togetherness” that is inclusive of the different components of a picture. By this I do not necessarily mean something pleasing and decorative. The harmonious effect can be obtained by highlighting the overall effect of the artwork, which is the sum total of its different parts. These parts have emerged from the actual bodily gestures of the painter, and whether the gestures are spontaneous or self-conscious will determine the impact of the artwork.

It is to be noted that spontaneity in art puts the artist in a difficult position. In fact, spontaneity in everyday situations is more often praised than practiced. And so it is in art. Spontaneity, pushed to the extreme, would lead to results that ignore completely artistic technique, an essential aspect of good art. Who believes now that Jackson Pollock’s paintings are entirely the result of spontaneity and that he ignored the essential techniques to achieve his masterpieces? As we know, he developed his works by placing the canvas on the floor and then dripping colors over it, paying extreme attention to the effects to be obtained. The end result is, of course, abstract; he was not trying to paint portraits or bouquets of flowers. He was trying, rather, to achieve a never-before-seen accumulation of lines of different colors, crossing each other with a logic—the logic of an unharmonious wholeness, whose meaning had to be explored for ever and ever. This was his novelty.

No doubt Pollock’s art is abstract art, yet how abstract? Is an uncommon form of representation completely absent from his work? The answer may leave some perplexed. But I would like to point out that there is a resemblance between at least some of Pollock’s works and the aereal view of an urban metropolis. All those lines, all those crossings and intersections, all those curved lines could be “remindful” of the confusion of a boundless city. This is surely stretching the point a bit. The dripping paintings remain abstract, I agree, but analogies are difficult to eradicate from the human mind and the human ability to perceive. This does not mean that Pollock’s paintings intended to resort to a
representational idea of what painting is. We cannot read his mind, and even less can we say that while painting he was thinking of the daily life of New York City.

Each work of art is the result, among other things, of the inner life of the artist. Moreover, analogies, although relevant to understanding the external aspect of some artworks, offer interpretations that are subject to controversy. They suggest more than explain the “how” and the reasons why an artist opts to begin work on a canvas or on a piece of paper. A purist would probably reject interpretations of works of art that emphasize the importance of the content of a work, especially in the case of abstract art. And there are reasons for that. Abstract art takes little notice of objectivity and realism, and by realism I intend to refer to the obvious truth that there are objects in the world that are measurable, tangible, and visible.

Yet even representational art is never “too” realistic; that is, it does not just copy objects without adding the subjective dimensions of the artist’s mind and hand. Therefore, we are in a situation in which both representational and abstract art are the results of different approaches, though both must reckon with means that are dependent on some aspects of reality. One of these means concerns the perception of the artist that may well be different in different artists. No art resorts to mere imitation, which produces only illustrations, not art, and even less abstract art. Who would try to copy a painting of Jackson Pollock? At the most, we can only photograph it, and we know that reproductions are never perfect.

I mention Pollock out of my sympathy for lines. I could have chosen Paul Klee’s example, but that would have raised additional questions and required more time. I return, then, to the issue of lines—to my way to abstraction, and to abstraction in general. When I paint, I begin by choosing a particular color. There is no specific reason why I chose that color, but as I proceed, my imagination and my perception pause for a moment as I step back and look at the lines I have painted, wider or thinner, as if they were almost human figures, crossing each other or looking at each other or just standing one in front of the other. All this plunges me into a state of mind full of ideas. I offer now another example: It can occur to me that two wide lines, one vertical and the other at an angle, bring to mind the monolithic heads of Easter Island. The resemblance is perhaps simply intuitive and subjective, and I cannot expect that different viewers would share my impression. However, if that were the case, then this could constitute an argument in favor of the fact that absolute abstraction is in itself an abstraction. Even considering the example just mentioned, I strongly resist the claim that painting is always somehow representational and that a watercolor of mine in its totality vaguely resembles natural objects like, say, trees or a leaf, and that the lines I paint are determined by some specific ontology. The end result is unforeseen precisely because when I begin to paint I do not think about determinate objects. What happens instead is that my mind (as far as I can speak of my mind, leaving aside any “contribution” from the unconscious) is in a floating state so that what guides my hand is a specific and even critical state, since I can guide my impulse to proceed in a determinate manner which my eyes find aesthetically promising, and at the same time I can reject what my eyes deem unpromising.

In Venice there is currently an art show (through the end of December) whose title is *The Illusion of Light*. The visitor who ventures to Palazzo Grassi is greeted in the courtyard with a work by the American artist Doug Wheeler that consists of a white, extremely luminous surface on which the viewer can walk (having been provided by the museum with clean, soft slippers). The surface itself is relatively soft, and as the viewer walks on it the effect of the light changes—not dramatically, but subtlety, giving the impression of being immersed in a white fog. The viewer may want to experiment and change the effect of the extreme light of the installation by playing with light itself, as I did. I put my sunglasses on and off to see the different effects that are produced beyond mere white light. I bring up this experience because it teaches us that light lends itself to be used in several ways, and also because it offered me the possibility to pause in front of another work at Palazzo Grassi that takes me back to the topic of abstract art. On an upper floor there are three square canvases of identical size, all painted white. The color white is obviously not chosen by chance. The artist could have chosen three totally black surfaces, so as to negate light. Yet, white gives the illusion of light in a more radical manner. This extreme form of abstraction retains however something that is “real”—that is, light or, better, luminosity, since we are speaking of artworks. Is light abstract?

Without entering into the scientific question of the theory of light as being made of particles or of waves, I will resort to the traditional, philosophical view of light as being incorporeal, which radiates everywhere and is a principle of formation. It is in itself of divine origin and as such capable of “inspiring” the highest thoughts in people.

As discussed, colors are carriers of light. To find a balance between form and color is the aim of many contemporary artists. In my case, since I am here to speak of what I mean when I discuss abstract art, I conclude by saying that the form/color balance must not be interpreted as involving symmetry. How could there be symmetry between colors and forms, given the fact that they are conceptually different? However, the balance I have in mind calls into play not the illusion of light, which would make light and luminosity too abstract, but instead formal compositions, aided by colors in such a way that both form and color aim at the same, or at least similar, quest for coherence. And the concept itself of coherence is far from making abstract art totally abstract.
Figure 5
St. Sebastian

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Abstract

In this art exhibition, I show and discuss one large mixed-media work, St. Sebastian, which I have worked on intermittently since May 1, 2000, and which remains unfinished. The work reflects my interest in visual complexity.

Keywords: visual art, case study, creativity.

Description

In this art exhibition, I show one large mixed-media work, St. Sebastian, which is mainly executed in acrylic paint, colored pencil, and graphite pencil on one sheet of heavy paper (approximately 245 cm tall by 153 cm wide). I have worked on it very intermittently for the last 14 years. This work has evolved in tandem with many aspects of my research career, as I have explored the nature of the creative process in the arts. The basic theme of the work is growth and decay (particularly of the body), taking advantage of the rising and falling movement inherent within the overall arch shape (going from lower left to top center to lower right.)

I began the work on May 1, 2000, tracing the outline of my body in what is now the inverted figure on the left side (most visible in the left leg fragment jutting up, less so in the torso and arms directly underneath). Following my usual process (at the time) of constructing highly layered images out of visual quotations from diverse sources, many other images are embedded within the work; all are drawn freehand, and most have personal associations either with Florence or Vienna. Embedded images include: Egon Schiele’s rendition of St. Sebastian (which gives the work its name), masks of Mahler and Dante on either side (recalling for me the onstage busts of Virgil and Ariosto at the start of Goethe’s Torquato Tasso), late Matisse cutouts, Paolo Uccello’s frescoes of the Great Flood in Santa Maria Novella, Michelangelo’s Victory (the torso and legs on the right) and Last Judgment (at far bottom right), Masaccio’s Trinity (the standing Madonna on the left) and Crucifixion of St. Peter (the loincloth on the invasive figure on the left), passages from paintings by composer Arnold Schoenberg of Alban Berg and Mahler’s Funeral, anatomical drawings by Da Vinci, as well as bones, muscles, and other anatomical elements inspired by my first viewing of an exhibition of plastinated corpses in Vienna in August of 1999 (see Hagens & Whalley, 1999).

At center left, Grimace, the Falstaffian McDonaldland fast food character, incongruously enters this world – to me, recalling Mahler’s remark on his tendency to mix banality with high drama in his music, the result (he thought) of having rushed into the street after a particularly upsetting incident of domestic strife in his childhood, and running into a musician playing “Ach, du lieber Augustin.”

There is also a self-portrait as a child at the bottom, referencing the putti at the bottom of Raphael’s Sistine Madonna, which provides one point of entry into the movement within the work. Other instances of self-portraiture include the lifemask toward the lower right and some linear imagery, in the central white orb, derived from fMRI scans of my brain.

In St. Sebastian, I attempt to balance coherence and comprehensibility with layering and a high degree of visual complexity, along the lines of Schoenberg’s First Chamber Symphony, a piece I often have in mind whenever I work on this picture. The layering also gives rise to an emphasis on varied textures and degrees of finish, a theme that links to my own creativity research (see, e.g., Kozbelt, 2009).

The structure of the composition, besides having a basic arch trajectory, is also subdivided into numerous progressively diminishing Golden sections, some of which contain echoes of other sections – as in the smaller portrait of Dante near the center echoing the larger one on the right side, or the Matisse cutout shapes – pinkish near the top and black further down. The orientation of the smaller sections, cued by the curved portion echoing the top of the entire work, frequently follows and thus reinforces the main arc movement of the whole composition. The arc itself is generated by an angle of 137.5 degrees, which is the most common angle at which successive leaves tend to grow from the stems of plants, and which is related to the Golden section by the formula $\phi = .618 = (360 – 137.5) / 360$.

The main Golden section division of the composition may also be interpreted as a water line, dividing the submerged lower portion of the work from the upper part, which is exposed to the air, culminating in the uniform cerulean sky at the top, which I associate with the Goethean sense of heiter, or serenity. On this reading, the aquatic/avian Matisse cutout forms may be viewed as briefly leaping into the light and air, before returning to primeval oblivion. It would not be false to say that I think of the work as a sort of altarpiece.

Reference

Figure 1. Some passages from *St. Sebastian*.
Abstract

Peirce called “the play of musement” what Sebeok defined as language, i.e. the modeling procedure specific to human beings as a species, through which it is possible to organize our experience and the surrounding reality spatially and temporally, and through which we can give meaning to the construction of a world. Similarly, Stochastic combined painting uses pieces which can be combined in an infinity of ways, creating an undetermined number of models which could be unassembled and combined again in new models. However, only some combinations of colored elements can cause interpretative conflicts which are unforeseeable, spontaneous, original, and which can therefore be hypothesized and verified experimentally. The aim of this research is to invent a stimulus which can provoke heterogeneous, nonconformist interpretations.

Keywords: modular combinatorial painting; colored triangles.

Stochastic Combined Painting

Introduction. Just like in language, the way which Sebeok (1984) meant it, combinatory procedure in Stochastic combined painting, allows one to use a finite number of elements to produce an unlimited number of senses and meanings. What Sebeok calls language is the syntactic, compositive and composite ability specific to human beings which precedes speech. The specific function of languages as modeling and “modelizing” procedure, which can create models by modeling, as a model for the construction of the world, is that of signifying, of interpreting, of assigning a meaning. This characteristic which is specific to the modeling device of human beings is what Peirce (1980) called “the play of musement”.

Moreover, this inventive ability of language, both in verbal and non-verbal languages, is autonomous from practical functions, from their usefulness and productivity but also from the cognitive, communicative function, from having to be useful to something or someone, from their “use for the conservation and reproduction of the existing order.”

In this possibility of non-functionality, of expressive excess, states Augusto Ponzio (2013), of something else in respect to the way things are, of the ‘already made world’, in a possibility of this ‘third sense’, in this possibility of the sense of ‘significance’ as Roland Barthes (1982) calls it to distinguish it from that of communication and the message and from that of signification, we can see the manifestation of the character which Ponzio calls writing, a primary modeling system which is properly human. Ponzio states that 'creativity,' which Chomsky considers as a specific character of verbal language, is actually derived in it, while it is typical of language, as a primary modeling procedure.

Language is a procedure which is specific to the human species, a procedure through which we can organize our lives and external reality spatially and temporally, and through which we can give a meaning to the construction of a world. Moreover language, through the same meaning and by using the same elements, allows human beings to give new meanings to reality and to create different worlds.

We could state that ‘matter’ as Hjemslev (1968) intended it, similarly to Hamlet’s cloud, can change shape anytime. Matter is physical, as far as the form of expression is concerned. As far as the form of the content is concerned, matter is the amorphous ‘bulk of thought’. The linguistic work of primary modeling confers, through modeling (secondary, tertiary), a determined form to matter.

Stochastic combined painting is made of colored triangular parallelepipeds (the bases are rectangular isosceles triangles), in aleatory combination.

The pieces which make up the work, just like phonemes, can combine, and like monemes can become more complex signs; they can become texts and stimulate reading processes and interpretations which are unpredictable and heterogeneous. Just like writing, as intended by Ponizio, independent from the communicative function of transcription, Stochastic combined painting, as a modeling of language, uses pieces which can be placed together in an infinite number of ways. In that way, it can create an undetermined number of models which can be unassembled and assembled again in new models.

Jakobson (1974) stated many times how, in the combination of non-figurative elements is abstract paintings, it is possible to see “a continuous cross-reference of the part to the whole, and from one part to another part, stimulations of expectations, a ‘significance’ phenomenon, which is diffused on the whole extension of a spatial and chronological texture” (Eco, 1984).

Regarding the combination of pictorial elements, in his paintings Seurat proposed the possibility of con-fusing, in the retina of the observer, dots of complementary colors, of the various color regions. By looking at the studies of Chevreul and Rood regarding colors and those of Henry regarding composition, Seurat cultivated his analytical practice of art. When talking about the artistic theory and practice of Sol LeWitt, Filiberto Menna (1975) assimilated it to the one with which Seurat funded the modern analytical investigation of art.
“The decisive novelty of Sol LeWitt consists in the fact that now the combination is arbitrary and conventional and not…based on Einfühlung” (Menna, 1975). However, arbitrariness and conventionality of a system (linguistic) must show the psychological projection of the users of such system. We have decided in this case not to pre-determine the perception and the projection in the interaction with the work (like in Seurat and also in Sol LeWitt) but to leave the ability to stimulate all the possible heterogeneous and spontaneous projections of the observers to the work. The composition is not pre-determined (figurative like in Seurat, or abstract-mathematical like in Sol LeWitt) but we have generated the possible combinations of the elements which constitute the work (shapes obtained with the combination of triangles and colors) stochastically. In this way, the possibilities to combine are not limited to the possible and personal proposals put forward by an author; all the possible combinations are taken into consideration. “Chance is the creator of meaning, and so the work itself, created by divine chance, is not a representation but radically an event.” (Benvenuto, 1994).

However, to be an event, as Lombardo (2002) states in his eventualist theory, only some solutions, such as the object of affection, can stimulate unique projections for the observer.

“Aesthetic values do not exist on their own in the work of art, they can only be conceived in function of an interpretation and of a re-creation”. (Evola, 1963).

It is possible to distinguish a common object from a work of art by starting from the consideration of interpretations, or better, of their conflictiveness.

Just as the object of affection, only some works of art, or, in our case, only some combinations of colored elements, can create interpretative conflicts which are unpredictable, spontaneous, original and can therefore be hypothesized and verified experimentally. In his eventualist theory Lombardo (1996) recognizes in the heterogeneity of interpretations one of the fundamental factors which the work of art must provoke.

“The public, according to this theory, interacts with the work of art by projecting on it its most intimate contents, so as to confirm its individual uniqueness and in order to express, through the originality of interpretation, the originality of its affective experience (Lombardo, 1987).”

Art, for Lombardo, has a social function of narcissist confirmation and reinforcement, which derives from the participation to the interpretative process.

We have already said that Sebeok considers language as a modeling procedure specific to human beings, through which human beings organize their lives and the surrounding reality spatially and temporally by giving it a meaning and constructing a world. Art, like specific language, must stimulate the participation to the creation of the world as ‘one’s own work’ (autonomy) and a perception of the world which is different from how it presents itself (interpretative ability). From this it is evident that Stochastic combined painting is not a work of art of abstract painting, it does not have the aim <<of showing the beauty of mathematical harmonies ”per se” >> (Lombardo, 1994), and neither it is an expressive or communicative aim of the soul or fantasy of the artist. It is an experimental research with the aim of inventing a stimulus which can efficiently provoke non-conformist interpretations. We obtain then a visual stimulus which can trigger a series of inferences in the search for its meaning.

The increase of a multitude of interpretative solutions captures the observer like an enigma to be solved. The contents are therefore ‘expressions’ of the observer and not of the artist. The particular characteristic of Stochastic painting, as Lombardo states regarding the multitude of interpretative solutions, is assigned to the possibility to ‘measure’ the arbitrariness of the interpretative contents in relation to the visual structures which provoke them; to invent new ones, with a higher degree of psychoactivity.

The eventualist value of a stimulus depends on the "relationship which people create with it, which is evaluated without applying medical or sociological diagnostic categories, but according to the dispersion of contents or behavior: the more they differ from each other, the more the event has taken place.” (Ferraris, 2004).

Just like a work of art, coming like an event, even "falling in love, is enigmatic like an emergency situation which forces people to a behavior which would have before been unthinkable, involuntarily creative and that can spontaneously lead to new aims in life...Viktor Sklovskij for art, like Stendhal for love, sees the event in the unpredictably dynamic relationship between the subject and the object, excluding the recognition of something known which only needs to be found in the loved one or in the work of art.” Ferraris (2006) says that Sklovskij “takes into consideration the eventuality of the end of the relationship, which places the object in the "already accomplished" area of the relationship, from which it will only be able to emerge if the subjects feel it in a different way and transform it in something new.”

Just like falling in love, the work of art-stimulus (according to the eventualist theory) depletes its effectiveness after a period of exposition, it decays and the stimulus becomes saturated.

“Since an interesting and at first disorientating stimulus must be to a certain extent unfamiliar, it is easy to hypothesize that after a long-term exposure it will become familiar and its eventualist score will decay. When an aesthetic stimulus has completely decayed it becomes an ordinary object. In such a case we say that the stimulus is saturated.” (Lombardo, 1996)

The decaying of the stimulus does therefore take place, through its saturation, consequent to a predictability of the stimulus and above all of to an homogeneousness of the interpretative responses. In other words, language becomes regulated and the responses become conformist. In the changing from active to saturated, it is possible to evaluate the duration of the aesthetic effectiveness of a stimulus. Duration is the amount of time needed for a stimulus to change from active to saturated.
Duration allows one to evaluate experimentally the aesthetic effectiveness of a stimulus in time. Duration is therefore the unit of time within which a stimulus, unvaried, results to be active. However, such duration is also the determination of a possible measurement of the effectiveness of a stimulus in its variables: complexity of the form, permutation of color etc. (the research aims to improve the aesthetic effectiveness of a stimulus) within which the stimulus is more or less effective. Regarding this last point, we have started an experimental path in order to 'measure', in Stochastic combined painting, the arbitrariness of interpretative contents in relation to the visual structures which would provoke them, and in order to improve the aesthetic effectiveness of the stimulus.

Sample. Some pupils (18 boys and 23 girls) attending middle school have created a certain amount of modular pictorial objects.

Stimulus. The modular pictorial objects have been achieved combining triangular prisms which we will call Pts, of different colors; with those Pts they filled a square surface of 35 x 35 cm. The base of the prisms are rectangular isosceles triangles, with a cathetus of 5 cm.

Method. The results were then displayed to different classes of pupils. The favorite combination was the one which organized 'images' which were more or less big.

Therefore, preference was assigned to the stimulus with more extended color regions (formed by more Pts) with a very modest presence of minimal regions, made up of 1 or 2 colored Pts. The most preferred compositions were those in which the majority of space was occupied by medium regions (3 to 10 Pts), a small part occupied by a whole, bigger region (up to 25 Pts) which avoided a formal redundancy especially in compositions with a small difference in the extension of medium regions, and few small regions made of 1 or 2 Pts.

Moreover, the most preferred compositions were those presenting equidistant colors associated to a complementary color, or compositions presenting a great luminance of primary colors.

Discussion. The observer tends to read iconic projections (I use the term icon as intended by Peirce) giving a meaning to shapes constituted by color regions. More than once this attitude has brought, in a different way for different observers, to combine different color regions with each other or singular triangles with different color regions in order to 'create' figures which make sense. In other words, we can say that some combinations have stimulated heterogeneous interpretations in the different observers.

We have optimized (based on the obtained results) such information trying to develop a method to produce modular combinatorial painting autonomously. We have decided to generate stochastic combinations in order to obtain a casual distribution of formal redundancy.

We have drawn a square (Q) of 35 x 35 cm. and we have divided it in 49 more squares measuring 5 x 5 cm. We have then divided each square in two rectangular isosceles triangles, selecting by lot the right-angle of the first of the two triangles, among the 4 right-angles of the square, and thus obtaining a congruent triangle. We then started to create the most extended region. We selected one of the 98 triangles in Q by lot. We then selected by lot the number (between 11 and 25) of triangles which were to be annexed to the previously chosen triangle in order to obtain our region. We then worked on medium extension regions. After choosing a new triangle among those available, we selected by lot the number (between 3 and 10) of triangles to annex to it, and we continued doing so until we covered 70% of the surface of Q. The remaining triangles, excluded from the big and medium regions, make up the smaller regions. At this point we can state that:

• each triangle is connected to the previous one through 2 contact points (2 vertices);
• each triangle is annexed to the previous one according to one of three possible positions, which is selected by lot: Hypotenuse in common between the two triangles, Common cathetus and adjacent right-angle, Common cathetus and consecutive right-angle;
• each triangle which is annexed to the previous one is selected by lot among all the possible triangles which could be connected to the previous one through 2 contact points (of course in the selection all those triangles which are part of a region which has already been formed are excluded).

After creating the regions, they have to be colored, taking into account that there can be no adjacent regions of the same color and that two regions of the same color cannot have more than one vertex in common.

As we have said, preference (in the results obtained until now) is assigned to compositions with equidistant colors associated to a complementary color or to compositions with different luminance of primary colors.

We have colored figure 1 (Y, R, B and W) using white and 5 colors made up of three different hues (yellow, red, blue), a luminance gradient of blue and another color resulted from mixing the other two hues. In order to study compositive preferences of shapes and colors in Stochastic combined painting, according to the previously-discussed parameters, we have to start a collaboration with Roberto De Nicoló (technology expert) to generate combinations by relying on algorithms and by implementing a software.

This algorithm generates triangles, colored on a pseudo-casual basis, by means of squares, each divided into 2 (or 4) parts by its diagonals. An important function created for the algorithm is:

hex2rgb: converts colors from hex to component format. To generate a random color you need 3 random integers, ranging from 0 to 255, representing its red, green and blue component.

Pseudo-randomness it's driven to obtain triangles not all random colored and independent each from the other, but producing, to the eye of the observer, several same-color-regions, each composed of a number of adjacent triangles having the same color.

Using perfect randomness, this would be statistically rare for a colors number > 4. It is likely with a number of colors equal to 3.
You'll have better results by driving the randomness in some directions. We increase the probability that an adjacent triangle will be same colored of another triangle taken as a reference.

We tried to get colored regions distribution as close as possible to the parameters defined by the experiment with rectangular shapes: 80% of the whole surface with medium-size colored regions, 10% approximately with big regions and 10% with small regions.

To achieve our goal, we introduce the following variables:

- **repetitions number** if the user wants to use a painting as a pattern, this number defines how many times the pattern will repeat;
- **raster or vector output** the user can have a vector output or a raster output canvas; the latest allows you to export it, for further editing, in several graphics software.
- **repeat pattern** this flag enables or disables pattern mode
- **rows number** the number of rows (of triangles) composing the painting. The elements of each row are a certain number of squares (N), each divided into 4 triangles. Then, for each M-squares-long row, you'll have Mx4 triangles.
- **columns number** the number of columns (of triangles) composing the painting. Each column is composed by a number of squares (M), each divided into 4 triangles. For each column, you'll have Nx4 triangles. Given M the number of rows and N the number of columns, your painting will be composed by MxNx4 triangles.
- **cathetus length** the length of the base of the right triangle, in pixels.
- **deviation** the extremes of color range are Lower Extremes: 0, Upper Extreme: 255. We reduce this range by a constant. When monospaced colors option is selected, the R, G, B component, is not a random number between 0 and 255 but, named LM the lower range deviation, and UM the upper range deviation, the new extremes are so defined: LE = 0 + LM; UE = 255 – UM; By decreasing these margins, you'll have stronger, distinct colors, while by increasing it, colors will bleed into gray, becoming less distinct each from the other.
- **colors number**

the number of random colors to generate. When colors are monospaced, and LM and UM are > 0, given k the chosen number of colors, then R component (same for G and B) will be generated by this formula:

$color(i)[R] = (0 + LM + ((255 – LM – UM) / k) * i)$

In a x(Red), y(Green), z(Blue) cartesian reference system, colors will be monospaced points placed on the three-dimensional angoloide bisector.

- **manual colors** if colors are manually chosen, they will be selected by clicking on a web safe palette.
- **samecolor probability** defines the probability that a pseudo-random number, will be identical to previous. Default value is 5.

**Algorithm**

- create a vector canvas given width and height in pixel;
- create an array, $clrcss$, of random generated colors;
- start two loops, from 0 to M – 1, generating rows the first and from 0 to N - 1, generating columns, the second;
- generate a bool random number, $allsamecolor$. 0 or 1, to decide if the colors of the 4 triangles must be all identical. If 1, then all four triangles will be same colored, if 0, generates another random number between 0 and (colors number – 1), to correlate previous-row, next-row, bottom-left upper-right triangle colors.
  - Is this the first line? The upper triangle color will be random;
  - Not the first line? I read the lower triangle color of the corresponding triangle of the previous row;
  - generate a $same_color_prob$ long array of the same color;
  - append this array to $clrcss$ colors array. The resulting array is $same_color_prob + color_number long$ and will have some identical colors and $color_number$ different colors;
  - generate random number between 0 and final array length;
  - give the upper triangle of my row, the color taken from the array, corresponding to the index of the random number generated in the previous step;
  - choose the left triangle color. If this is the first row, the algorithm generates this color in a random way;
  - if this is not the first row, read the color of the left adjacent triangle;
  - generate another $same_color_prob$ long array containing the same color;
  - append this array to $clrcss$ array. The resulting array is $same_color_prob + color_number long$ and will have some identical colors and $color_number$ different colors;
  - generate random number between 0 and final array length;
  - give the left triangle color of the element of the array corresponding to the previous generated number index;
  - give the colors to the triangles and repeat the process;
Figure 1: Y, R, B and W
Acknowledgments

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Beyond Time: The Aesthetics of Interactive Multimedia Art and Design

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Abstract

Beyond Time is an interactive, multimedia art installation that integrates images, words, and sounds, inspired by indigenous cultures, with visualizations of scientific data. The installation juxtaposes spatial and temporal relationships, defined by intuitive, sensory responses to the environment, with mathematical representations of space and time. The fluid integration of these different conceptual models is symbolized by continuous shapes, animations, rhythmic sounds, and the movements of the viewers as they interact with the programs. The artwork creates a visual and conceptual framework for understanding how we interpret physical and virtual spaces.

Keywords: interactive aesthetics; multimedia art; metasyntax; interaction design.

Introduction

With the development of writing came linguistic categories, deductive reasoning, and diachronic logic, all of which defined sequential hierarchies in space and time (Search, 1996). Scientific logic, including the Cartesian concept of the mind/body split, perpetuated the idea of duality and an “either/or” perspective rather than the synthesis of ideas.

Interactive multimedia computing in art and design creates opportunities to explore the aesthetics of space and time. The integration of different media, movement, rhythm, and virtual space with the surrounding physical space creates immersive environments that challenge us to engage in new spatial and temporal experiences. The process of navigation in interactive, multimedia programs reveals new patterns of relationships between the groups. Jay Bolter (1991) pointed out that “Elements in the electronic writing space are not simply chaotic; they are instead in a perpetual state of reorganization. They form patterns, constellations, which are in constant danger of breaking down and combining into new patterns…” (p. 9).

In the interactive, multimedia installation titled Beyond Time, I explore new multiliteracy models for interaction design called HyperGlyphs. I blend those models with symbols from contemporary scientific data visualizations. HyperGlyphs are inspired by the images, words, songs, and rhythms in oral communication in indigenous cultures. These cultures use visual symbols, words, audiovisual rhythms, physical movements, and sound to represent their cognitive and sensory connections with the physical and spiritual worlds. These connections are characterized by fluid relationships and layers of associations that form an integrated whole.

Contemporary scientists share similar perspectives and acknowledge that data is not subject to fixed results or interpretations. Instead, scientific data consists of dynamic, multidimensional relationships that are defined by context and how the context changes over space and time.

HyperGlyphs and contemporary science research are characterized by layers of sensory and cognitive information that change with the viewer’s actions, resulting in an interactive aesthetic that is defined by metastructural dynamics, cognitive mapping, and perceptual encoding.

Metastructural Dynamics

Interactive, multimedia design creates webs of sequential and simultaneous events. Linear models, based on the sequential mapping of events over time, give way to multidimensional models. It is possible to visualize logical, sequential processes, but also create syntactic filters for simultaneously mapping multiple perspectives in space and time. As a result, new syntactical relationships continually emerge. The geometry of mathematical models and the logical syntax of programming languages create a conceptual framework for synthesizing complex webs of associations. The underlying structure of computer logic and mathematics shapes our interpretation of spatiotemporal representations and movements.

Contemporary science also integrates mathematical logic and dynamic, flexible data models. Classical physics was built on the reductionist theory that time and space are rigid and constant. Deterministic logic and reductionist theories limited the interpretation of physical forces to strict causation. Reality was an objective truth, and the scientist was a passive observer looking on. Newton (1934) pointed out:

Absolute, True, and Mathematical Time . . . flows equably without regard to any thing external . . .  
Absolute Space, in its own nature, without regard to any thing external, remains always similar and immovable (p. 6).

However, in science, as in mathematics, theories of indeterminism eventually replaced the basic unit of Aristotelian logic, the syllogism, which is based on the “if-then” proposition. In the 19th century, the linear determinism of Euclidean geometry and Aristotelian logic gave way to dynamic mathematical models that used terms like betweenness, translation, reflection, projective, inverse, and hyperplanes to describe flexible, multidimensional relationships (Search, 1993). Contemporary scientists learned that data is not subject to fixed results or interpretations. Our understanding of data is defined by dynamic relationships that change over space and time. Albert Einstein, Neils Bohr, and de Broglie understood that electrons could exist as either particles or waves (wave-particle duality), depending on how
they function and how we perceive these functions in different contexts. The linear dimensions of strict causation, that characterized classical physics, were replaced by a matrix of interactive relationships. With the introduction of relativity and quantum physics, a new scientific model of the world emerged in which dynamic interactions replaced static, linear forces.

Einstein demonstrated that space and time are not absolute. Both space and time are multidimensional forces that defy the limitation of perceptual interpretation. At the speed of light, time encompasses both the present and the future. “Time ceases to change because it contains all change” (Shlain, p. 125). Spatial representations also merge at high speeds. As space is compressed, multiple views of objects are possible from a single perspective because planes and volumes become one (Shlain, 1991). Lehrer (2014) pointed out, “The more we know about reality—about its quantum mechanics and neural origins—the more palpable its paradoxes become” (para. 7).

Quantum physics is a pluralistic and highly abstract model of spatiotemporal interaction. The theory of complementarity, introduced by Neils Bohr, describes the “antithetical duality of physical forces” (Shlain, p. 23) and demonstrates that forces can operate simultaneously in the same place and time. Lehrer (2014) noted that Bohr was fascinated with cubist paintings and compared the structure of matter to this style of art:

Bohr’s discerning conviction was that the invisible world of the electron was essentially a cubist world. What Bohr maintained was that the form they took depended on how you looked at them. Their very nature was a consequence of our observation. This meant that electrons weren’t like little planets at all. Instead, they were like one of Picasso’s deconstructed guitars, a blur of brushstrokes that only made sense once you stared at it. The art that looked so strange was actually telling the truth. (para. 4)

In contemporary physics, there is no longer any such thing as “objective” reality. Relationships were defined by the participation and interpretation of the observer. It is now possible to visualize scientific interpretations of reality by creating metastructural environments that expand the intuitive dimensions of space and time into abstract models of a dynamic, virtual world. As in interactive computing, space and time are flexible entities that describe relationships between events.

**Cognitive Mapping and Perceptual Encoding**

A semantic-syntactic network of images, text, and sound directs actions and expectations in interactive, multimedia design. The viewer constructs associations based on expectations and experience, but must continually redefine these cognitive maps using cross-modal perception that integrates the semiotics of visuals, text, sound, and movement. The viewer must construct a system of relational codes to interpret the associations.

In cross-model communication, a metasyntax emerges that integrates the elements. Multiple levels of perceptual encoding, spatial and temporal relationships, and cognitive associations may exist. Recursive patterns emerge as symbols that become interpretations of symbols. This discursive dialog adds meaning to the temporal transformation of information. The integration of physical and virtual spaces in interactive computing adds new levels of sensory abstraction to the layers of relational encoding. The higher knowledge of abstraction defines the dynamics between human perception and reality by creating multidimensional models that are virtual extensions of the physical world.

Similarly, mathematicians and scientists use reflective abstraction to create patterns that visualize logical processes and simultaneous relationships. Steen (1988) described mathematics as a “science of patterns” with abstract levels of visual encoding in which “theories emerge as patterns” (p. 616). According to mathematician Jacques Hadamard (1954), images are important to provide a “simultaneous view of all the arguments” (p. 77). Mathematicians use patterns to understand the structure of a problem, and then reconstruct and improve their intuitive understanding of numerical relationships. Multiple levels of perceptual encoding create a model for describing “those aspects of visual modes of thought that appear to lie beyond the analogy of mere sight” (West, 1991, p. 290).

In multimedia computing, line, color, texture, rhythm, movement, sound, and the audiovisual interplay between these elements transform one- and two-dimensional patterns into cross-modal extensions of space and time. The integration of layers of light, form, and sound with the physical interaction in virtual and physical spaces creates a spatiotemporal continuum that synthesizes the audiovisual information and actions into an integrated whole. Cognition and perception add meaning to the dynamic processes and interrelationships that change over time. Logical analysis is augmented by the perceptual, holistic synthesis of visual patterns. Multiple levels of perceptual encoding create a flexible framework for tentative truths. Objective reality gives way to reflective abstraction that redefines perceptual knowledge by constructing new knowledge beyond the limitations of logic and expectation. As with data visualization in mathematics and science, this abstraction leads to new methods of defining and visualizing spatiotemporal concepts.

**Beyond Time**

*Beyond Time* is an interactive, multimedia art installation that integrates metastructural dynamics, cognitive mapping, and perceptual encoding into a dynamic, immersive experience. Viewers interact with two multimedia computer programs that project graphics, text, and animations onto a blank wall. The visual information appears in transparent layers that integrate the physical and virtual spaces. The programs also include sound that creates an immersive, spatiotemporal experience. The layers of audiovisual information continually change as viewers interact with the programs. The
installation is an example of the “environmental fluidity” that Zabel (2010) described as an “aesthetic-technological” dimension of interactive digital art that distinguishes this type of art from other art forms (Definitive Theses, para.5).

Beyond Time integrates new multiliteracy models for interaction design called HyperGlyphs with symbols from contemporary scientific data visualizations. Audiovisual information from indigenous cultures is juxtaposed with visual patterns created with data visualization software. Spatial and temporal relationships, defined by intuitive, sensory responses to the environment, are integrated with mathematical representations of space and time. The installation reflects the parallel, metastructural dynamics of interactive, multimedia computing, indigenous cultures, and contemporary science—all of which make relationships not subject to fixed results or interpretations, but instead consist of dynamic, multidimensional associations that are defined by context and how context changes over space and time.

Sound and visual designs create different layers and depths in space that represent the integrated whole and the temporal transformation of ideas. The granularity of spatial representation ranges from contrast on the specific or localized representation, which is achieved with graphics and numerical representations, to contrast on the infinite or non-localized space, which is achieved with sound.

In the installation, the fluid integration of these conceptual models is symbolized by continuous shapes, animations, rhythmic sounds, and the movements of the viewers as they interact with the hardware that controls the programs. Transparent forms and top-down perspectives create layers of visual data that encourage diverse interpretations and define multidimensional arrays that symbolize simultaneous and sequential levels of spatiotemporal perception. These layers of symbolism are juxtaposed with numerical data and visual images that represent scientific data (Figures 1 and 2). Grayscale images contrast with full color images and symbolize the different types of reality that are inherent in the discrete, mathematical representations of the physical world, and in the interpretations based on human intuition and sensory perception (Figure 2). Images fade and blend together to signify this integration of different realities. This synthesis of audiovisual information contrasts with the discrete order of numerical computations. However, there is a rhythmic counterpoint of forms in which everything has its right position in relation to the whole.

The text in the installation adds still another dimension to the art. The text is inspired by the songs and chants indigenous peoples use to express their relationships to the physical and spiritual environments. The words and phrases symbolize the continuity of the natural and spiritual worlds, as well as the human perception of experiences through space and time. This language is juxtaposed with the mathematical language and visualizations scientists use to express spatial and temporal relationships.

In Beyond Time, language is a dynamic structure that is not locked into a specific meanings or associations. This flexibility is achieved by juxtaposing text with abstract visual and audio patterns. When coupled with abstraction, text takes on the discursive characteristics of the visual imagery and sound. This indeterminacy in language underscores the actual and the possible by creating an open framework for interpretation. As the cursor moves over a line of text, the line is replaced with new text. Individual lines of text on the screen reveal multiple layers of text that create graphical representations of complex relationships in space and time. The layers of text create new semantic structures that reveal a matrix of changing associations. Tonality shifts add spatial depth and rhythm to the audiovisual patterns. Diachronic references to place and time such as here and there, now and then, collapse space and time into the present. There is a focus on the present and the “time within.”

As viewers interact with the artwork, light, images, and sound penetrate the physical space, symbolizing the spatial relationships in and between objects, as well as the relationships with embodiment and perception. Sound surrounds the viewer and helps the viewer integrate the three-dimensionality of the physical world with the two-dimensional patterns in the virtual space. Sound underscores the significance of space and is a constant reminder that space is not an empty void. This combination of audio and visuals creates a counterpoint of shapes and sounds that emphasizes the space between events and the dynamic interplay between changing relationships.

In Beyond Time, rhythmic patterns that repeat throughout the program suggest new relationships and the integration of diverse elements into the whole. The repetition of similar rhythmic patterns in text, sound, and animations suggests continuity and flexibility and establishes unity by creating a coherent structure for diverse elements. The rhythm of the physical interaction adds another dimension to the audiovisual space. The rhythmic movement of the viewer’s interaction creates a syncopated backdrop to the audio and visual patterns.

This accumulating rhythm, with its changing dynamics, creates an engaging, immersive experience for the viewer. The syntactic structure of the audiovisual information becomes an integral part of the surrounding physical and architectural space. Space becomes all-inclusive and n-dimensional. The patterns of color and light become mirrored visions of spaces within space. The sensory experience embraces space and time from all directions, rather than limiting the vantage point to a unique perspective. Logical dimensions of space and time contrast with perceptual transformations that challenge the limitations of causation, expectations, and experiential reality.

Conclusion

The metastructural dynamics in this installation integrate structure and control into a spatiotemporal continuum. Time is defined as an infinite extension of space through the abstract forms, rhythm, movement, and sound. Time transcends the physical and virtual dimensions of reality. The rhythm of interaction results in spatial representations of time.
that establish a conceptual link between the physical and virtual dimensions of the environment and the metastructural dynamics of the cognitive models. We are forced to construct meaning between the world of scientific data and the world of human perception and experience. Siler (1990) coined the term “metaphorming” to describe this cognitive and perceptual transformation of space and time:

In metaphorming something, we can traverse the constraints of logic and verbal thought, transferring or relating from one object to another a new meaning, pattern, or set of associations. Like the language of pure mathematics, which can describe abstract n-dimensional processes and forms, the symbolic language of metaphorms is also multidimensional. It operates simultaneously on many planes of associations, nuances, and meanings. (p. 31)

Interactive, digital technology enables us to modify perspectives and restructure information. Models of reality, defined by abstract descriptions of tentative truths, are subject to constant reevaluation. Marvin Minsky (1986) noted that we must understand “insulations before we can comprehend interactions” (p. 319). In science and interactive, multimedia computing, the ensuing dialog between logic and perception leads to an eternal quest for new perspectives. Minsky (1986) also pointed out that we need to understand the interaction of two types of complementary knowledge: “We search for ‘islands of consistency’ within which ordinary reasoning seems safe. We work also to find and mark the unsafe boundaries of those domains” (p. 277).

Beyond Time visualizes these complementary forces and helps us understand the limitations of perception and logic, thus enabling us to transform those “unsafe” boundaries into new knowledge and insights about the complex world around us. The installation creates an engaging visual and conceptual framework for understanding how we interpret physical and virtual spaces. The work also highlights the need to use multiple types of engagement to shape perspectives and create a holistic understanding of the complex world around us.

References

Figure 1: In *Beyond Time*, layers of audiovisual information integrate scientific data with language and forms inspired by oral traditions in indigenous cultures.

Figure 2: Additional images from *Beyond Time* show layers of graphics and text that transform over time.
Abstract
Photographic art offers a point of view intended to elicit an aesthetic experience. Of course the exact nature of such experiences has been bandied about by philosophers, scientists, and artists. For me, photography offers an opportunity to participate in the creative process as well as providing a means of examining how viewers respond to art. The images presented here are intended to elicit an integrated experience, drawing on perceptual, conceptual, and emotional processes. They adhere to my scholarly analysis of the I-SKE model, a simple framework for empirical analyses of aesthetics which considers the intention of the artist and three primary components of the beholder’s experience: sensation, knowledge, and emotion.

Keywords: Photography, art, aesthetics.

Abstracting Nature
Anyone who has stood behind a camera with the intent of creating "art," understands the importance of selecting a specific point of view. Slight alternations in camera position, tilt, or focus can dramatically change the characteristics of the captured image. During the printing process, selective cropping, highlighting, and tonal adjustments help to sharpen the final artwork. As with brain processes, the photographic artist abstracts natural scenes and through selection, filtering, and sharpening, imparts meaning to a captured image.

I developed an interest in the psychology of aesthetics in my quest to hone my photographic skills in composition, lighting, and printmaking. I also learned from people’s responses and became intrigued by such questions as: What attracts people to some images but not others? How does tonal contrast, balance, and form influence aesthetic responses? How can an image create a point of view or communicate a thought? Photography led me to connect this avocation with my scholarly interest in cognitive science. I began teaching a freshman seminar on the Psychology of Art and more recently co-edited a volume with Steve Palmer entitled, Aesthetic Science: Connecting Minds, Brains, and Experience (Shimamura & Palmer, 2012) and presented my own perspective in Experiencing Art: In the Brain of the Beholder (Shimamura, 2013).

The I-SKE Model
Beauty, surprise, anger, sadness, disgust, horror, and a myriad of other emotions occur when we experience art. Some artworks generate such feelings rather quickly, while others depend on thought and knowledge. I argue that every response to art depends on what we know—which includes implicit knowledge about the world, cultural knowledge, knowledge gained from personal experiences, and even knowledge about the art process itself. As I began to explore the psychological (and biological) underpinnings of the beholder's experience, I developed a framework for empirical analyses, which I call the I-SKE model (Shimamura, 2012; 2013). The model identifies four essential features that drive aesthetic experiences: the artist's intention to offer a work for aesthetic appreciation, and three psychological components that drive the beholder's experience: sensation, knowledge, and emotion (see Figure 1).

Figure 4: The I-SKE Model

With respect to the beholder’s share—an apt term coined by Ernst Gombrich to describe the role of schema in our art experience (Gombrich, 1960)—the I-SKE model places knowledge at the same level as sensations and emotions during our art experience. For example, prior knowledge is key in generating rapid implicit associations that facilitate scene perception, object recognition, familiarity responses,
and culture-induced biases. At a more deliberate pace, knowledge-based processes come into play when artworks are analyzed and interpreted from a conceptual perspective. In fact, every picture tells a story, and knowledge plays a significant role in interpreting artworks. Neurocognitive research suggests that knowledge-based processes work somewhat independently but must interact with sensory and emotional processes to elicit an aesthetic response.

**Sensations, Thoughts, and Feelings**

Philosophical analyses have considered formalist, expressionist, and conceptual approaches to art. A formalist approach views artworks purely on the basis of the lines, colors, shapes, and shadings of an artwork without paying attention to the objects portrayed (see Bell, 1914). Such an approach allowed early 20th century beholders to appreciate abstract art, as it was not necessary to identify "objects" in a painting. Interestingly, works by early 20th photographers, such as Edward Weston, Paul Strand, and Alvin Langdon Coburn, could be interpreted from a formalist approach, as their images emphasized the flow of lines, shapes, and shadings without the need to consider the object portrayed, which could be rather mundane things, such as plates or shells. These days, a strictly formalist approach is denigrated as we now appreciate the importance of the meaning attached to any artwork in terms of not only the objects represented but also the historical, cultural, and political context within which an artwork is conceptualized. However, I contend that the formal qualities of an artwork still drive aesthetic experiences, yet as the I-SKE model suggests, sensory features must not be the sole properties that drive our aesthetic response. In my exhibited photographs, a formalist approach was considered in driving the sensory flow defined by particular point of view captured.

Many museum-goers adopt an expressionist approach while viewing artworks. That is, they expect art to generate for them an emotional response—typically one related to positive hedonics, such as beauty or serenity. Of course, other works may elicit fear, awe, sadness, or even disgust. Emotions and knowledge work interactively as it is often the way an artwork is interpreted that drives the emotional response. For example, the image entitled "Broken Memories" (Figure 2) depicts shards of ceramic plates, cups, and pottery scattered on the ground. From a formalist approach, this image could be appreciated as an "abstract" work defined by the smattering of colors and shapes. With the associated title, my intention is made clear by the association of these shards to someone's past which has now been discarded. Such knowledge of course can drive an emotional response, which then allows an expressionist interpretation.

Similarly, the image entitled "Graceful Aging" (Figure 3) can be viewed from a formalist approach by appreciating the lines and shadings depicted. The fact that the object shown is a dying rose adds meaning and with it an emotional response. One viewer said that the image brought tears and sadness as it reminded her of her mother who had recently died. My intention was to create a tonal quality—from the formalist school of Edward Weston—though with the added feature of a dying flower, which of course in its youth is associated with beauty. I, however, suggest that the wilted rose itself has its own sense of beauty as suggested by the title.

As noted above, all art depends on knowledge. We never view artworks with "naïve" eyes. With respect to "Broken Memories," it is necessary to know that the shards were once part someone's daily existence. When viewing "Graceful Aging" it is necessary to know that the object is a dying flower. I took "Subway Stories" (Figure 4) with the intent that the individuals portrayed in the scene, separated by the concrete posts, each tells a story. It plays on the notion that when we see a stranger in a public setting we often develop a narrative—an entire biography—of the person. The concrete posts act as story dividers, almost like a strip of movie film which tells an ongoing story. As with the other images, my intention was also to emphasize a formalist approach, as the figures act as abstractions of form as most appear silhouetted against the background.

I contend that when one elicits an heightened aesthetic response, one that I refer to as that "wow" feeling, all three components of the beholder's share—sensations, knowledge, and emotion—are at their maximum (Shimamura, 2013). Indeed, it may be useful when considering aesthetic responses—both personally and scientifically—to address how an artwork drives sensations, thoughts, and feelings, not just any one of these components in isolation. It was my hope that the images exhibited act to drive aesthetic experiences in this manner.

**References**

Appendix

Figure 5: Broken Memories
Figure 6: Subway Stories

Figure 7: Graceful Aging
Abstract
In the mid 1970’s, I decided to develop some of my art work using the nervous system as the subject. In this way I could combine my scientific understanding of the nervous system based on my training in cognitive neuroscience of vision with my more intuitive and emotional approach grounded in my visual art training. Since I have always tried to have my work be thoughtful rather than spectacular, this idea was an intriguing possibility. This article is a review of the project which has been a significant part of my work since then and is the basis of the work in the Art Exhibition.

Keywords: Neural Art; interactive art

Introduction
In 1974 I published a short article developing the idea that since the visual nervous system is especially sensitive to lines and edges, there are limits on the aesthetic experience (Shortess, 1974). Other special sensitivities, such as color, produce similar limitations. My first approach to making art for this project was based on the ideas from this article. An example is shown in Figure 1.

Figure 1: “Edges One”, oil on canvas.

However, as I thought about the possibilities, I looked more closely at the properties of the nervous system and selected three features that I found particularly interesting for artistic development. They are 1) the anatomical network structure of the nervous system 2) the time-varying sequence of neural impulses which operate within the structural network and 3) the interaction of the nerve cells with the external environment. This has resulted in four types works: 1) interactive conceptual pieces in which I asked viewers to try to experience the nervous system as a work of art or conceptualize an experience as activity of the nervous system, 2) artist or visual books, 3) paintings with overlaid grids to suggest the neural network interface between inner experience and outer reality and 4) interactive sound installations which generate impulse-like sounds when viewers move in the space in front of the pieces.

I published a summary of these first efforts, which included descriptions of some of my conceptual works, one of the paintings with the grids, and my first two installations (Shortess, 1983). I am grateful to Frank Malina, the late founding editor of Leonardo, who, during the course of this editorial process, helped to develop the name, Neural Art, for what I was doing.

In 1987, I published a second article in which I described four more of my interactive sound installations which were done in the context of my Neural Art ideas (Shortess, 1987). A more theoretical article was published in 1989 (Shortess, 1989). From 1982 through 1986, I also participated in the symposia of the Small Computers in the Arts group, which were quite helpful in developing my ideas (Shortess, 1982; 1983b; 1984; 1985; 1986).

Conceptual Works
The most fully developed conceptual piece focused on thinking about the nervous system as a work of art, “Neural Concept”. In 1979, I presented viewers with a wall panel that included framed instructions, printed cards and a drop box with a slot in the top.

The text of the instructions is as follows:
“As we look around and experience the visual environment, the activity of our nerve cells is modulated by what we see. Try to conceptualize these changes in membrane permeability, transmitter release, impulse initiation and information integration. Creatively manipulate these ideas and look at the world from this perspective. The nerve cells are then active at another level. Conceptualize this activity as your work of art. Please take a card below and, after commenting, drop it in the box. Other forms of reaction are also welcome.

George K. Shortess”

The layout of the printed card is shown in Figure 2.

Figure 2: Response card for “Neural Concept”.
I did a number of variations on this idea with different panel displays and different versions of the card in the box. They were displayed in a variety of group exhibits in the local area from 1977 to 1979.

I presented some of these conceptual ideas at an art exhibition (1981) and a poster session (1984) associated with the conventions of the American Psychological Association. The responses were mixed. Some thought it was a great idea, others wondered what it had to do with art and still others swore at me. One person called me on the phone to apologize for her “hasty and immature response.” She had second thoughts after leaving the exhibitions, looked me up in the phone book and called. We had a good conversation about what I was trying to do.

**Artist Books**

As I indicated above, some of my artists’ books have also been done within the Neural Art conceptual framework. In 1986-88 I made and exhibited a series of books which reflect ideas about the nervous system and perceptual experience. I programmed my Apple 2E computer to print the sequence of pages. In each, there is a progression in the array of letters from a completely randomized order to a very structured array, a reflection of the way our nervous systems organize a confusing world. Further, each copy has a unique sequence of letters and words within the same overall structure, since each was printed separately under computer control. This reflects the individual differences of our nervous systems within the same larger structure.

The idea of forcing the computer, which was designed for consistent performance, to create randomness and unique copies was, for me, a commentary about the nature of the human nervous system. In the first book I used the six letter word, NEURAL (Figure 3). Subsequent books used the words: YOUARE, ITHINK, MENTAL, and SYSTEM in the same format. I did one more book in which I used six word groupings, each six letters long: ITHINK YOUARE MENTAL IMAGES MADEBY ABRAIN arranged in a similar way. Currently, copies of NEURAL and ITHINK are in the Franklin Furnace Archive at the Museum of Modern Art in New York.

**Paintings**

These Neural Art paintings are based on the idea that a painting can be a window on the world, an idea which goes back to at least the Renaissance. (e.g. Arnheim, 1974). Since the nervous system provides a real interface between our inner experiences and external reality, I created paintings representing an external reality but with a network structure representing the nervous system which appears to be between the viewer and reality.

Figure 4: “Coliseum Perceived”, watercolor/ink on acid free paper; “Packer Chapel”, Ink on acid free paper.

Much of my earlier painting and drawing had been focused on interpretations of the landscape both natural and constructed. It was therefore natural to use these types of landscapes to represent external reality. I developed a variety of ways to represent the neural interface as shown in Figures 4 and 5.

Figure 5: “Live Oak”, watercolor/ink on acid free paper.

“Live Oak” (Figure 5) is particularly interesting in that I put down the grid in tape on the paper, painted the tree and then removed the tape to create the white grid. Visually the grid appears in front of the tree, but physically it is the white paper behind the painting.

As my paintings continued to develop I began to replace the grid patterns with single words, phrases or free form poetry, providing a merging of my conceptual art ideas with paintings as windows on the world (Figure 6). The free form poetry was often created while I was painting and then either added immediately or later after some editing. Later I did a
series of larger works (30 x 48 inches) with words, grids and expressive gestures in paint in order to try to capture the dynamics of neural process (Figure 7).

Figure 6: “What Is”, watercolor/ink on acid free paper.

Figure 7: “Memories”, acrylic on canvas

Figure 8: “Within You”, acrylic on panel

The most recent work based on these ideas is a series I call the lathe series, since the frames and overlaying structure are pieces of wooden plaster lathe (Figure 8). These works move me away from representational reality to abstract forms with suggestive words and shapes for the viewer to contemplate.

Interactive Installations

Nerve impulses are a primary way in which neurons communicate with each other, particularly as sensory systems respond to the external environment and convey that information into the central nervous system. Because they are an integral part of the interface between our inner and outer worlds, I decided to incorporate the sounds of impulses into my paintings. To do this, I built small electronic pulse generators that produce patterns of pops to simulate nerve impulses when activated. I built picture frames that are deeper than usual for some of my paintings. In these deep frames I installed a generator with a speaker behind the painting. The generator is operated by a switch on the side of the frame. Viewers are free to turn on and off the switch as they see fit, and listen to the “patterns of impulses” as they view the painting. Figure 9 shows an example, “Parthenon Perceived”, which also incorporates a form of the painted neural interface discussed above. The brass plate on the bottom of the frame asks the viewer to “operate the switch on the right and listen while you look”. I showed a number of these works in a variety of group shows including, in 1978, in a Group Exhibition at 112 Workshop, New York City, NY.

Figure 9: “Parthenon Perceived”, oil on canvas, electronics

While this was interesting I was not quite satisfied because the viewer had to turn on a switch, which was not very natural. I needed some way to automatically generate the impulse patterns when viewers moved in front of the paintings. Fortunately about this time in the late 1970’s, Apple had just released the Apple 2E micro-computer. With the Apple 2E, I build my first interactive sculpture/installation which I named “Network” (Figure 10).

Figure 10. “Network”, aluminum tubing, electronics

It is made of aluminum tubing and stands about 7 feet tall, 20 feet long and 2 feet deep. There are small square covered boxes at all of the intersections of the tubing. Each of eight of these square boxes contains a small speaker. Inside each of the three front legs is a very sensitive light photocell. There are small holes in the legs through which light from the track lighting activates each photocell. When someone moves
in front of a leg the shadow changes the amount of light reaching the photocell, and thus its electrical resistance. The photocells are wired to the microcomputer, which is monitoring the resistance of the photocells. When a change in resistance occurs the microcomputer generates a sequence of clicks (simulated nerve impulses) that are sent to a subset of the eight speakers at the intersections of the tubing. There is randomness in the program so that each time a photocell is activated a different pattern of impulses is sent to a different set of speakers. I did all the programming in Basic, but am indebted to David Rayna for designing and constructing the analogue to digital converters that I used to provide the interface with the computer.

Figure 11: People interacting with “Network of Hope”  
Ars Electronica, Linz, Austria

Expanding on the ideas and technology involved in “Network”, I created a number of individual interactive sculptures that generated sound patterns simulating nerve impulses. These were shown in a number of one man and group exhibits including Ars Electronica in Linz, Austria (Figure 11). Here I displayed discarded material that interactively produced impulse patterns as a way of suggesting that we need to know where we have been in order to have hope. All knowing is neural.

Using the Apple 2E I also created several sculptures in which movements by viewers changed the monitor display. I also began to do some site specific works still using the interactive sounds simulating neural impulses. For example, I transformed a large tree into an interactive sound sculpture at the Mayfair Festival in Allentown, PA. Similarly, the Frank Lloyd Wright Library at the Allentown Art Museum was transformed. People moving in these spaces generated patterns of simulated nerve impulses.

As the technology advanced, I incorporated samplers which allowed me to use musical notes and voices in my sound interactive sculptures and installations. Many of these art works had explicit or implied references to my neural art ideas. But in all cases, I resisted the temptation to use the technology for making spectacular effects just for their own sake. I wanted to focus on thought provoking work. For example, in one installation using a sampler, during the mid 1990’s, I developed a room sized piece, “Doorways of Meaning”, which I first showed at the Galerie Rene Blouin, Montreal, Quebec, Canada (Figure 12).

Figure 12: People interacting with “Red Network”,  
Montreal Canada

I hung red and green cord networks and illuminated them with red and green lights which encouraged viewers to create complimentary colored shadows on the walls. Viewers, as they moved around the room, triggered photocells that generated voices (from a sampler) that spoke about the doorway as a metaphor for the boundary between inner and outer experience. There were eight voice segments. The number of segments and the particular segments that were triggered each time were randomly determined. This created a variety of sounds and more of an impression than a logical narrative. The voices were both male and female as well as speaking in French and English. It was later shown at the Allentown Art Museum with all the voices speaking in English. Two examples of the voice segments were “Doorways through the worlds of matter and of hope” and “Introspections of our inner neural juices produce a mind”.

Figure 13: “An Interfacing Hut”, wood, acrylic paint and electronics
A more recent work uses the idea of a hut with an inner and outer space that reflects our inner and outer worlds of experience and reality (Figure 13). A sensor hidden inside the doorway triggers the sampler to generate the voice segments randomly and in various combinations when viewers move in front of the hut. Several of the segments are “Outside is public”, Inside is private” and “Reflect on the outside while inside”.

The work that I am showing here at the Congress, “Seeing the Landscape from within” (Figure 14), is a recently complete interactive sculpture in which I have used an earlier Neural Art painting as the visual anchor for interactive voice segments that are heard coming from the base cabinet. They speak to the idea that the external reality of the landscape is represented and known only as part of our inner experiences, which in turn are based in neural processes.

While some of my more recent works have continued to have explicit references to the neural basis of art and experience, other work has moved away from a direct reference to it. However, it is always in the back of my mind and influences me as I develop new work.

References
End of the Proceedings.