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REFLECTIONS ON PSYCHOLOGICAL AND NEUROAESTHETICS[1]

SUMMARY: The article offers observations about some aspects of the current relationship between psychological aesthetics and neuroaesthetics. In addition to criticism of the occasionally less than rigorous process of inference in neuroaesthetics, reservations are expressed about the ability of neuroaesthetics to address successfully, at least in the next few decades, some seemingly key questions. Among them are those about the vertical theoretical integration of data from different art modalities, as well as about the relationship of various neural correlates, on one hand, and the differential quality of aesthetic episodes, on the other – especially episodes involving peak aesthetic experiences (such as aesthetic awe and being-moved). The article concludes with several concrete suggestions for a potentially interesting and fruitful collaboration of psychological aesthetics and neuroaesthetics.

KEY WORDS: Critique of neuroaesthetics; psychological aesthetics; vertical theoretical integration; reductionism; neural correlates of peak aesthetic experiences; aesthetic awe; being-moved; thrills or chills; critique of embodiment thesis of paintings' effects.

In this article, I offer observations about some aspects of the current relationship between psychological aesthetics and neuroaesthetics, along with some hopefully constructive suggestions (especially in section 4.). This will be accompanied by criticism of the occasionally less than careful process of inference in neuroaesthetics and by reservations about its ability to answer, at least in the next decade, some key questions, such as those about the quality of peak aesthetic experiences. It goes without saying that the range and depth of my observations are constrained by time limitations and the nature of the occasion. There are four sections, which are devoted, respectively, to the following issues: difficulties in

1 These remarks are derived from the first half of an invited lecture at the symposium on psychological and philosophical aesthetics at the Max-Planck-Institut für empirische Ästhetik in Frankfurt, Germany, December 11-13, 2014. It also draws on the author's article in a forthcoming issue of the *American Journal of Psychology* ("Emotion in painting and art installations"). http://konecni.ucsd.edu/pdf/Konecni_Emotion_in_Painting_and_Art_Installations_AJP_in _press.pdf

vertical theory-building; peak aesthetic responses and neural correlates; neuroaesthetic and other work relevant to the "embodiment" thesis of paintings' effects; and, finally, a brief mention of some interesting possibilities of collaboration of psychological and neuroaesthetics.

1. Difficulties in vertical theory-building

A genuine, theory-based, vertical integration of data, ranging from those on neural underpinnings to those concerned with the rare, *peak* aesthetic responses, is clearly desirable. However, an important question remains: Is it possible to maintain and develop a primarily *psychology*-based empirical and theoretical aesthetics, "psycho-aesthetics," as I have called it for 30 years (see, most recently, Konečni, 2012) in which practitioners are well informed of neuroaesthetic findings, but not overwhelmed or *bound* by them? Philosophers such as Hyman (2010) and Croft (2011) have asked analogous questions, sometimes in the form of a sharp critique of neuroaestheticians' claims – for example, those made by Ramachandran and Hirstein (1999) and Zeki (1999).

Needless to say, there is in this debate a serious philosophy-of-science issue of *reductionism*, discussed since the late 1940s, for example, by B. F. Skinner, and Donald Hebb, but largely neglected in the past 15-20 years, due in part to the avalanche of "scanners" (neuro-practitioners and machines). The influx of dubious "open-access" journals, and of economic recession driven mutual approval and citation "clubs," has certainly not encouraged the long view and a restraint in claims that are made.

There are many frequently and uncritically cited neuroaesthetic studies, published even by practitioners of some repute, which can be given as examples of the apparently somewhat limited usefulness of neuroaesthetics. Consider, as only one such instance, the much cited experiment by Kirk, Skov, Hulme, Christensen, and Zeki (2009). Participants, in scanners, viewed the *same* artworks, but labeled either "gallery" or "computer" (that is, computer-generated). The results were that artworks labeled "gallery" were preferred by the participants and that these higher ratings for the "gallery" artworks correlated with more activity (*f*MRI) in the medial orbitofrontal cortex – which is *also* associated with "reward" – actually quite diverse kinds of rewards.

Please note the implication of the wording above and consider the extent to which causation and correlation are, despite strenuous protestations by neuroaestheticians and other neuroscientists, often mixed up in neuroaesthetic literature, perhaps especially in articles on the so-called mirror-neuron "system", sometimes in the very titles of articles, including by prominent neuroaestheticians.

Regarding the Kirk et al. finding, a psycho-aesthetician may be entitled to say: "Who cares? The neuroscientist has learned something within his domain, but not I. There is nothing new here concerning aesthetics, the quality of aesthetic experience, or the nature of "aesthetic reward." In fact, at the verbal-report level, it's just another example of the 'prestige effect,' that has been studied for decades in the psychology of (social) influence, including in the arts."

Furthermore, the research by Kirk et al. (2009) does not begin to answer a potentially very interesting question that is relevant beyond the prestige effect: Is orbitofrontal cortex equally active when participants (a) report genuine liking and (b) when they report liking because that is *what they think they ought to say* in the research situation? This is not just the matter of detection of yes/no lying, but of the fine shades of deception. It is a very complex question that neuroscience may not be able to answer for many years. It will require a great deal of research grant money (that the CIA and NSA may be happy to provide!).

2. Peak aesthetic responses and neural correlates

It is also useful to examine some features of a situation in which the conceptual relationship (in the sense of extremeness, depth, and frequency) among aesthetic responses is indeed vertically related to neural correlates. On one hand, one has Aesthetic Trinity Theory (ATT; Konečni, 2005; 2011). In this theoretical position, *Aesthetic Awe*, the peak aesthetic response, extremely rare and memorable, has been hypothesized as the prototypical response to the independently defined *sublime* stimulus-in-context (characterized by grandeur, rarity, great beauty, and inaccessibility, among other attributes). The theory is meant to have implications for both visual stimuli and music (unlike many other positions in both psychological and philosophical aesthetics). Aesthetic Awe is related to the fundamental emotions in certain respects (including the psychophysiological components and an impressive memorability), but different in others – such as the ease with which it can be intentionally "switched off," as well as the requirement of existential safety. The "trinity" in the theory's name refers to its tripartite structure, which includes, in addition to Aesthetic Awe, the less pronounced and more frequent states of *Being-Moved*, and (physiological) *Thrills* (or chills or frisson), in a hierarchical arrangement.

So, on one hand, ATT, and on the other hand, the much cited article by Blood and Zatorre (2001), the implications of which I analyzed in a number of articles starting with 2007. Using PET (positron emission tomography), Blood and Zatorre found that participants' music-induced Thrills (which they call, in their title, with a certain degree of exaggeration, "intensely pleasurable responses", p. 11818) cor-

relate with activity in "brain regions thought to be involved in reward, motivation, emotion, and arousal, including ventral striatum, midbrain, amygdala, orbitofrontal cortex, and ventral medial prefrontal cortex." They add: "These brain structures are known to be active in response to other euphoria-inducing stimuli, such as food, sex, and drugs of abuse" (p. 11818).

But the crux is in the method, and there are several important psycho- and neuroaesthetic lessons to be learned from the Blood and Zatorre method and procedure – especially by colleagues who unfortunately cite papers without reading beyond the abstract. Hopefully, these remarks will reduce the overgeneralizing pronouncements made about the Blood and Zatorre research.

A. Subjective verbal report by the participants was indispensable. Neuroresearchers *needed these verbal reports* to know whether and when participants experienced Thrills.

B. The music stimuli were selected by the participants. They were music students who brought their own CDs on which they indicated the exact short passages to which they had, in the past, repeatedly and strongly responded with Thrills.

C. "Control music": One participant's "Thrill-stimulus" passage was another participant's "control" passage. The very important finding here (in a certain negative sense) was that *not a single participant responded with Thrills to another participant's "Thrill-stimulus" passage, only to his or her own.*

D. This suggests that *music-qua-music* was *not* producing the Thrills; rather, the constellation of social, emotional, sexual, drug-related, and other factors associated with *the real-life acquisition of the Thrills response to a passage* was responsible. (This is, in fact, far more interesting for the music-causes-emotion discussion than neural correlates.)

E. In ATT terms, the strength and reliability of the participants' responses to their Thrills-passages suggest that they were experiencing not only Thrills but also the less frequent and more powerful Being-Moved state (Konečni, Wanic, & Brown, 2007; Konečni, 2011; Kuehnast, Wagner, Wassiliwizky, Jacobsen, & Menninghaus, 2014).

F. Another very important conclusion is that it is *impossible to determine the quality of the subjective response to an aesthetic stimulus* by neuro-imaging alone.

In sum: I am rather skeptical about the possibility of a profound contribution of neuroaesthetics to psycho-aesthetics at this time. The advances that are necessary – of parallel distributed processing (based on ideas from the 1980s; see, for example, McClelland & Rumelhart, 1985), nonlinear dynamics, and recursive networks – seem at present to be in the mid-distant to distant future of neuroscience. This is in agreement with the thinking of Singer (2013).

Mainstream neuroscience often deals with simpler stimuli and participants – for example, sugar administered to newborns and rats, such as those used when Berridge, Robinson, and Aldridge (2009), tried to distinguish between "liking," "wanting," and learning – than neuroaesthetics needs to do in order *to contribute usefully* and avoid the overreaching of many neuroaestheticians.

My point is that the causal factors for the *quality* of aesthetic experience presumably are computations "above" the machine-observable neural effects (which area [multiply responsible] "lights up" in the brain). But at the computational level, aesthetic judgment may not be qualitatively different from other complicated operations, such as problem-solving. Needless to say, these are very complex issues in the brain-mind-conscious-and-subconscious-thought nexus.

Therefore, for conceptual, methodological, philosophy-of-science, and practical reasons, I would suggest a careful re-evaluation of the current, probably exaggerated, influence of neuroaesthetics on psychological aesthetics, in terms of priorities and research agendas.

3. Neuroaesthetic and other work relevant to the "embodiment" thesis of paintings' effects

The speculative article by Freedberg and Gallese (2007; an art historian and a neuroscientist), should be viewed against the background of "neuroaesthetics" of Zeki (1999) and Ramachandran and Hirstein (1999), and the discovery of "mirror neurons" in the frontal area F5 of the macaque (di Pellegrino, Fadiga, Fogassi, Gallese, & Rizzolatti, 1992; Gallese, Fadiga, Fogassi, & Rizzolatti, 1996). However, it is essential to consider, in this context, the work of Chong, Cunnington, Williams, Kanwisher, and Mattingley (2008), Dinstein (2008), Dinstein, Hasson, Rubin, and Heeger (2007), and Visalberghi and Fragaszy (2002), with regard to the claims of existence of mirror neurons *in humans*. In addition, there exists the thorough critique by Hickok (2009), in which he outlined the problems of generalizing to higher-order functions, such as imitation and empathy.

Nevertheless, Freedberg and Gallese made the following rather sweeping claim (p.197): "We propose that a crucial element of esthetic response consists of the activation of embodied mechanisms encompassing the simulations of actions, emotions and corporeal sensation, and that these mechanisms are universal." To a criticism by Casati and Pignocchi (2007, in the same journal, p. 410), to the effect that the Freedberg-Gallese thesis is irrelevant with regard to aesthetic experience, Gallese and Freedberg (2007, p. 411), stated, perhaps even more sweepingly: "[W]e claimed that no esthetic judgment is possible without a consideration of the role of mirroring mechanisms in the forms of simulated embodiment and empathetic

engagement that follow upon visual observation." Furthermore, they cast aside any introspective or phenomenological objection, or the possibility of empirical testability, by stating that aesthetic judgment and empathetic engagement "might be precognitive and not always dependent on perception informed by cognition" (Gallese & Freedberg, p. 411).

The Freedberg-Gallese (2007) striking speculations have been addressed in three experimental reports. The first of these, by Umiltà, Berchio, Sestito, Freedberg, and Gallese (2012), described an experiment in which participants viewed digitized images of abstract artworks by Lucio Fontana ("showing one, two, and three cuts in the canvas," p. 2); these works were discussed by Freedberg and Gallese, 2007, Fig. 3, p. 199). As control stimuli, Umiltà et al. used graphically modified versions of the original artworks "displaying the same graphic pattern," (p. 2). In addition to recording cortical motor activation (EEG on two clusters in each hemisphere), the experimenters obtained subjective ratings of aesthetic appraisal (liking). The findings were that the participants liked the originals more and considered them as real artworks more; in addition, *mu* rhythm suppression was evoked when looking at original artworks, but not by control stimuli.

The authors' conclusions were that participants' embodied simulation can occur to minimalistic stimuli, but only when they are authentic artworks (contrary, incidentally, to the original claim by Freedberg & Gallese, 2007) and that the effect of "empathetic simulation" leading to liking is associated with motor activation in the viewer's brain. But there is a serious methodological problem concerning these conclusions. To be convincing at all, the experiment required at least one more control group. The differences between Fontana's originals and the control stimuli used by Umiltà, et al. (as presented in their Fig. 1, p. 2, of., 2012) are *multiple* – in an implied tri-dimensionality, as well as in the "depth" and thickness of line. These multi-componential differences can be simply stated: the controls, unlike the originals, were *not elaborated.* A condition needed to test the hypothesis properly and avoid *confirmation bias* requires *elaborated, non-art,* Fontana-like stimuli, such as, for example, slashes in green. Without an additional control of this kind, the interpretation is open to doubt. Furthermore, no aspect of these data speaks to viewers' emotions being evoked, nor did the authors make such a claim. One is therefore at a loss to understand the frequent mis- and overinterpretation of this work.

In the second study, Taylor, Witt, and Grimaldi (2012) experimentally tested the idea presented by Freedberg and Gallese (2007) that "covert involuntary simulation" takes place when people observe abstract "gestural" paintings. In five experiments, "participants executed arm movements resembling the act of painting horizontal brushstrokes while observing paintings featuring broad, discernable brushstrokes" (Taylor et al., 2012, p. 26). The panting stimuli were set up so that

the direction of the apparent strokes could be to the left or right and the direction of index-finger movement necessary to execute the response (pressing a button) also to the left or right. The main dependent variable was response time. The authors' expectation was that participants would respond faster in the "compatible" left-left and right-right conditions. The prediction in all five experiment was a two-way crossover interaction. Such interactions were generally obtained, with a major exception in the main study (Exp. 1, p. 28).

Significantly, no aspect of these results addresses the issue of viewers' emotion, nor the degree of liking for the "doctored" abstract artworks: this is a straightforward compatibility study, frequently encountered in cognitive psychology. In addition, the movement required for the response and the response-time measure itself have no analogues in the real-world viewing of artworks.

Finally, the third experimental study of the Freedberg-Gallese (2007) notions addressed the same issue as did Taylor et al. (2012), "that viewing artwork may activate neural movement programs associated with the way the artwork was produced" (Leder, Bär, & Topolinski, 2012, p. 1479). In this work, "pointillist-style" and "stroke-style" ("postimpressionist") paintings were used as stimuli and viewed in a random order for an undisclosed length of time on a within-subjects basis. Participants (between subjects) either "stippled" or made 20 cm left-to-right "strokes" (using a pencil occluded from their view). They did this either while viewing and evaluating the paintings (allegedly achieving "resonance") or five minutes before viewing and evaluating (no "resonance"). Even with two of the three factors being between-subjects, the predicted three-way interaction was significant at $p < .001$ – a very rare statistical event. As significantly, Leder et al. did not comment on two aspects of the results. Contrary to the hypothesis, there was the finding of a main effect of the time of the hand movement, such that the hand-movement-five-minutes-before control group significantly preferred paintings overall to the hand-movement-at-the-time-of-viewing experimental group. Even ignoring this main effect, there is the fact that the pointillist-with-stippling-while-viewing cell did not differ from the pointillist-with-stippling-before-viewing cell (means of 4.58 vs. 4.42 on a 7-point scale of liking the artwork, Fig. 1, p. 1480); and there was, in fact, a reversal in the stroke-style-with-stroking-while-viewing cell vs. stroke-style-with-stroking-before-viewing cell (4.28 vs. 4.47) – which indicates no effect of "resonance" in both of these key comparisons. The highest cell in the experiment was the pointillist-with-stroking-before-viewing cell (4.88), contrary to all predictions.

About this set of findings, I wrote the following in another article (Konečni, in press): "With regard to relevance for aesthetic appreciation, the Leder et al. (2012) study holds an advantage over the Taylor et al. (2012) experiments in that a measure of 'liking' for the works was obtained. Nevertheless, given the results, the

Leder et al. (2012) study neither supports the Freedberg-Gallese speculative notions, nor contributes to an understanding of the appreciation of authentic paintings from an important period in art history, the 1890s. And it is irrelevant for the issues of induction of viewers' emotion by paintings."

4. Some possibilities of collaboration of psycho- and neuroaesthetics

Whereas a meaningful vertical integration of neuroscientific and psychological (experiential, behavioral) data may be the ultimate goal, and the neuro-"capturing" of peak experiences a distant possibility, there seem to exist more modest, but currently feasible and worthwhile, experimental opportunities for collaboration. On the following rudimentary and, of course, highly personal list, are areas of investigation in which neuroscience may become involved in addressing some classical issues of both psycho- and philoaesthetics. The key aspect of all the proposed areas is the quality of "aesthetic reward."

A. Effects of paintings *versus* art installations (Konečni, in press) on emotions and aesthetic experience. The comparative issues of size and "immersion" (relevant to the *sublime*) cannot be adequately investigated in scanners with most stimuli. However, a comparison of the neural effect of equally well-known stimuli that, however, differ in *associative value* with regard to features that are crucial to the *sublime*, such as (implied) *real-world size* (e.g., the picture of *Mona Lisa* versus the picture of the Khufu/Cheops pyramid) may be a worthwhile endeavor.

B. Comparing the neural effects of absolute music and abstract art (obviously after adjusting for differential baselines), as well as their combined effects, with regard to the relative strength and quality of aesthetic experience. Important stimulus properties, such as complexity and novelty, that can both be objectively and subjectively measured in both musical and visual artworks, can be studied in their roles of mediating variables.

C. Contributing to the unraveling of one of the genuine mysteries of psychoaesthetics – the *hedonic trajectory* (in terms of the intensity of experience, time-course, frequency of exposure per unit time, etc.) of appreciators' voluntary *repeated exposure* to a work of art (especially a piece of music, for logistical and other reasons) over long time periods, including a lifetime.

D. Aesthetics and insight in chess problem-solving. This line of combined psycho- and neuroaesthetic research is proposed only in part tongue-in-cheek, for the aesthetics of problem-solving in mathematics, and (only marginally more accessibly by average people) in chess, have been unfairly neglected. Chess problems, such as checkmates in two and three moves, not to mention complex free-play enigmas with numerous moves known as "studies," hold an immense aesthetic

appeal to the initiated aficionados. An important aspect of the appeal is the insight/"aha" in the process of solving, but that is only a part of the experience. Solving a chess problem differs enormously from that of solving an anagram, because the solutions have not just different degrees of difficulty, but more importantly, a vastly different degree of *beauty* (especially to the connoisseur). The basic research issue can be summarized as follows: At the insight/"aha" moments (which all problems contain), are the successful solutions of *more aesthetically pleasing* problems (independently of problem difficulty) associated with a greater amount of neural activity? For this research, I would gladly be Participant No. 1 in the scanner!

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Razmišljanja o psihološkoj estetici i neuroestetici

(Apstrakt)

Članak razmatra neke aspekte odnosa između psihološke estetike i neuroestetike. Pored pregleda literature koji pokazuje da proces metodološkog zaključivanja u neuroestetici povremeno nije rigorozan, naglašena je i uzdržanost u proceni de će neuroestetici biti moguće, bar tokom nekoliko sledećih decenija, da ozbiljno obrati pažnju na zaista vitalna pitanja. Jedno od njih je *vertikalna* teorijska integracija podataka iz različitih domena umetnosti, a drugo je odnos nervnih korelata i *raznovrsnih osobenosti* estetskih epizoda – naročito onih koje predstavljaju *vrhunske estetske doživljaje*, poput estetske ushićenosti i zadivljenosti (aesthetic awe), kao i tronutosti i dirnutosti (being-moved). Članak takođe nudi nekoliko konkretnih sugestija za potencijalno interesantnu i plodnu saradnju psihološke estetike i neuroestetike.

KLJUČNE REČI: Kritika neuroestetike; psihološka estetika; vertikalna teorijska integracija; redukcionizam; nervni korelati vrhunskih estetskih doživljaja; estetska ushićenost i zadivljenost; tronutost; žmarci i ježenje; kritika teze o otelotvorenju u slikarstvu.