Available online at www.sciencedirect.com

ScienceDirect

Physics of Life Reviews 13 (2015) 67–70

PHYSICS of LIFE reviews

www.elsevier.com/locate/plrev

Comment

Aesthetic emotions to art – What they are and what makes them special
Comment on "The quartet theory of human emotions: An integrative and neurofunctional model" by S. Koelsch et al.

Helmut Leder *, Patrick S. Markey, Matthew Pelowski

University of Vienna, Department of Psychology, Liebiggasse 5, 1010 Vienna, Austria

Received 14 April 2015; accepted 15 April 2015

Available online 30 April 2015

Communicated by L. Perlovsky

Establishing a functional understanding of emotional processes is crucial for profound insight into human cognition and behavior [6]. The study of human interactions with art provides an excellent window into the complex emotional reactions that can be had with the environment. Recent advances in the empirical study of art reception have given rise to new models [8,9], and a growing interest in aesthetic affect and emotion.

Current findings in aesthetics especially highlight several major issues pertaining to emotion. First, it has become clear that there is no localized seat in the brain for our affective experience, which instead emerges from the interaction among nodes of a broadly distributed network of cortical and subcortical regions [2,3,8,13]. Steps beyond a simple focus on reward-related aspects to other elements of emotional experience are also needed.

Moreover, an ongoing debate in empirical aesthetics is concerned with whether emotions derived from art differ in quality or quantity from other, everyday emotions. In art, individuals often seem able to savor emotional reactions to otherwise negative stimuli, or even to enjoy negative emotional responses (sadness, disgust) [5,11,14]. Although often of positive valence, emotional reactions in aesthetic contexts often seem weaker than similar reactions arising from more personal connections, such as in "real life". This suggests that aesthetic emotions may have a more cognitive vs. visceral component, or that they lack action tendencies. At the same time, even in visual art sometimes quite strong and moving emotions can be elicited, e.g. when perceivers are moved to tears or experience transformative reactions [10]. This raises the question of how emotions might be differently processed, given the context [4], or whether one may find points of inflection regarding emotional tone or valence in cognitive processing and corresponding brain regions.

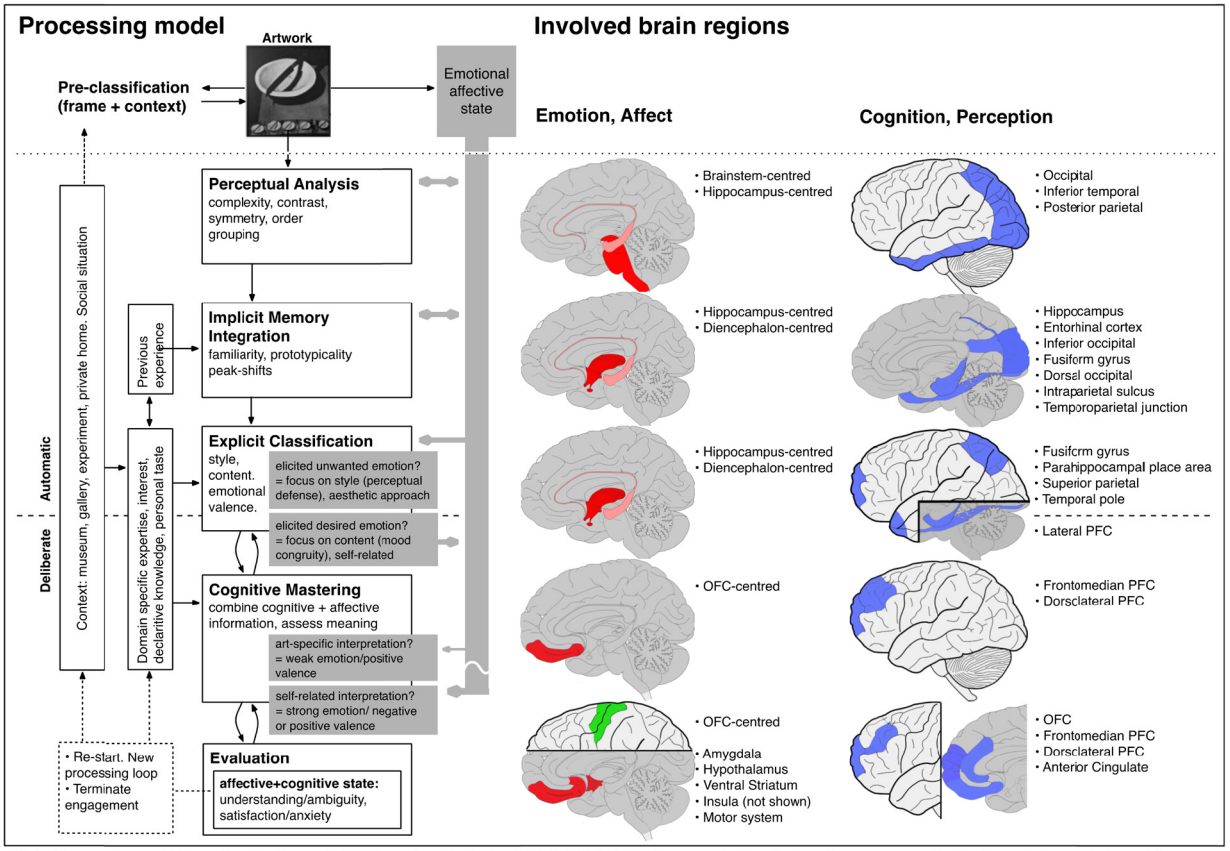
To resolve these issues, processing models need to integrate cognitive stages with relevant brain areas, and with new theories of emotional response. The key to understanding the neurobiological foundations of our cognitive/emotional reactions may lie in charting the dynamics of integrative networks of interconnected brain areas. The new quartet theory model by Koelsch et al. may help in this endeavor. By connecting specific brain systems to action tendencies

DOI of original article: http://dx.doi.org/10.1016/j.plrev.2015.03.001.

* Corresponding author. Tel.: +4369910022882.

E-mail address: Helmut.leder@univie.ac.at (H. Leder).

http://dx.doi.org/10.1016/j.plrev.2015.04.037



Note: Processing model based on Leder et al. (2004; updated in Leder & Nadal, 2014). Red areas refer to affect systems proposed in the Quartet theory (adapted from Koelsch et al., 2015). Green areas refer to regions not specifically included in affect systems by Koelsch et al. Blue areas refer to cognitive processing stages of the Leder et al. model. Dark grey brain figure refers to medial hemispheric surface. Light grey refers to lateral surface. OFC = Orbitofrontal Cortex, PFC = Prefrontal Cortex.

Fig. 1. A model of aesthetic appreciation and emotion including relevant brain areas. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

and motor response, the authors provide intriguing areas for future research that may explain emotional differences based on differences in context.

An integrated figure of aesthetic processing and emotional experience

Our model, originally published in [7] (updated in [8]) represents the prevalent basis for discussion of aesthetic processing. In Fig. 1 we have combined this model's processing stages with brain structures that have been previously connected to aesthetic processing [8]. Regarding emotion, we have added a column for the key points made in the quartet theory. As can be seen, aesthetic experiences are described by five stages, encompassing an initial pre-classification, and subsequent stages of perceptual processing, implicit memory integration, explicit classification, cognitive mastering – in which art or self-related interpretations are tested against the explicitly represented contents – and evaluation of cognitive and affective states, leading to emotion and aesthetic judgment.

When considering brain areas, the first step, perceptual analysis, involves early processing of low level sensory features, such as luminance, color, form, etc. This mainly occurs in the occipital and inferior temporal cortex, as well as in the posterior parietal cortex, which is associated with spatial exploration [12]. The implicit memory integration may involve different regions of the occipital and the parietal cortex [1] and is characterized by activation of the hippocampus and the entorhinal cortex [3], two brain regions in the medial temporal lobe prominently known for memory processing. Explicit classification is related to activation in the adjacent parahippocampal and fusiform gyri of the temporal lobe, as well as to areas in the left lateral prefrontal cortex [4]. Cognitive mastering is continued in areas of prefrontal cortex and the temporal poles [1]. Finally, cognitive evaluation is associated with several reward related

regions, mainly in the frontal cortex (orbitofrontal, medial frontal and anterior cingulate cortex, ventral striatum, insula [3]).

Turning to the Koelsch et al. theory, we can also see how this model may delineate brain components which together contribute to the emotional aspects of aesthetic experience. This may build from involvement of the brainstem-centred affect system in the initial perceptual analysis, providing a mechanism for very early categorization of stimuli, based on relevance detection and modulation of rising activation. Subsequent stages of memory integration and classification may then rely on the diencephalon-centred affect system (thalamus and hypothalamus), which imbues incoming sensory information with affective valence and sets the path for the later cognitive mastering and evaluative judgment. The hippocampus-centred affect system may play an important role in memory integration and in generating emotion components from sensory and interoceptive information. Finally, the orbitofrontal-centred affect system would generate fast, non-conscious cognitive appraisal of aesthetic objects, including coping potential and "moral affects" [6, p. 23], and this may be important for the cognitive mastery and evaluation stages. Also in accordance with Koelsch et al. the insula appears to be another region that is central to emotion integration [4] and has consistently been found to be linked with aesthetic appreciation. Activation of the motor system may also be connected to aesthetic appreciation [3], reflecting implicit empathetic responses.

Most interesting, this combination of models promises intriguing insight regarding the above questions of difference in valence, amplitude and emotional context. For example, the diencephalon-centred affect system, functioning as a central gatekeeper for attention (e.g., thalamus), might be a key target for modulating emotion experience based on the outcome of classification. Similarly, cognitive mastery may connect to activation in the OFC, modulating the strength and subjective quality of felt experiences in an aesthetic or everyday context. In addition, while the model of aesthetic experiences posits both automatic and deliberate processing stages of visual aesthetics, the emotional processes displayed in the quartet theory all happen at a non-conscious level, setting the stage for integrated affective judgments at a conscious level. Although the topic is obviously more complex than can be considered in detail here, we conclude that the quartet theory acts as an auspicious starting point for successfully shedding light on the multi-faceted occurrence of affective experiences in relation to art and aesthetics.

Acknowledgements

This research was supported by a grant from WWTF CS11-023-LedRos and a FWF grant P23538 to HL.

References

[1] Cela-Conde CJ, Agnati L, Huston JP, Mora F, Nadal M. The neural foundations of aesthetic appreciation. Prog Neurobiol 2011;94(1):39–48. http://dx.doi.org/10.1016/j.pneurobio.2011.03.003.

[2] Cela-Conde CJ, García-Prieto J, Ramasco JJ, Mirasso CR, Bajo R, Munar E, et al. Dynamics of brain networks in the aesthetic appreciation. Proc Natl Acad Sci 2013;110(Suppl. 2):10454–61. http://dx.doi.org/10.1073/pnas.1302855110.

[3] Chatterjee A, Vartanian O. Neuroaesthetics. Trends Cogn Sci 2014;18(7):370–5. http://dx.doi.org/10.1016/j.tics.2014.03.003. 24768244.

[4] Cupchik GC, Vartanian O, Crawley A, Mikulis DJ. Viewing artworks: contributions of cognitive control and perceptual facilitation to aesthetic experience. Brain Cogn 2009;70(1):84–91. http://dx.doi.org/10.1016/j.bandc.2009.01.003.

[5] Gerger G, Leder H, Kremer A. Context effects on emotional and aesthetic evaluations of artworks and IAPS pictures. Acta Psychol 2014;151(0):174–83. http://dx.doi.org/10.1016/j.actpsy.2014.06.008.

[6] Koelsch S, Jacobs AM, Menninghaus W, Liebal K, Klann-Delius G, von Scheve C, et al. The quartet theory of human emotions: an integrative and neurofunctional model. Phys Life Rev 2015;13:1–27 [in this issue].

[7] Leder H, Belke B, Oeberst A, Augustin MD. A model of aesthetic appreciation and aesthetic judgments. Br J Psychol 2004;95:489–508.

[8] Leder H, Nadal M. Ten years of a model of aesthetic appreciation and aesthetic judgments: the aesthetic episode – developments and challenges in empirical aesthetics. Br J Psychol 2014;105(4):443–64. http://dx.doi.org/10.1111/bjop.12084.

[9] Pelowski M, Akiba F. A model of art perception, evaluation and emotion in transformative aesthetic experience. New Ideas Psychol 2011;29(2):80–97. http://dx.doi.org/10.1016/j.newideapsych.2010.04.001.

[10] Pelowski M, Akiba F, Palacios V. Satori, koan and aesthetic experience: exploring the "realization of emptiness" in Buddhist enlightenment via empirical study of modern art. Psyke & Logos 2012:236–68.

[11] Silvia PJ. Looking past pleasure: anger, confusion, disgust, pride, surprise, and other unusual aesthetic emotions. Psychol Aesthet Creat Arts 2009;3(1):48–51. http://dx.doi.org/10.1037/a0014632.

[12] Vartanian O, Skov M. Neural correlates of viewing paintings: evidence from a quantitative meta-analysis of functional magnetic resonance imaging data. Brain Cogn 2014;87:52–6. http://dx.doi.org/10.1016/j.bandc.2014.03.004.

[13] Vessel EA, Starr GG, Rubin N. The brain on art: intense aesthetic experience activates the default mode network. Front Human Neurosci 2012;6. http://dx.doi.org/10.3389/fnhum.2012.00066.
[14] Wagner V, Menninghaus W, Hanich J, Jacobsen T. Art schema effects on affective experience: the case of disgusting images. Psychol Aesthet Creat Arts 2014;8(2):120–9. http://dx.doi.org/10.1037/a0036126.