An Interdisciplinary Perspective Towards Explaining the Visual Aesthetic Experience: The Case of Emotion

Ryan J. Slaby

r.slaby@campus.unimib.it

This paper discusses the empirical findings concerning the visual aesthetic experience in a neurological context. Accordingly, the aim of this paper is to shed light on the common ground across neuroscience, psychology, and philosophy to pave new roads for empirical research. Cognitive models posit that the brain employs neural networks mediating bottom-up and top-down processes, and in effect, engenders emotion and reward throughout the visual aesthetic experience. Likewise, empathy and its corresponding recruitment of bodily processes may facilitate the understanding of a visual artwork's depicted emotion, which may allow the viewer to engage with the visual artwork from a psychological distance and, consequently, to experience pleasure regardless of the visual artwork's emotional content. In conclusion, empathetic processes may be central to the visual aesthetic experience and should be considered by future empirical research investigating the visual aesthetic experience.

Keywords: Visual Aesthetics, Emotion, Empathy, Neuroaesthetics

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1. Introduction

Stepping down into a cave in Sulawesi, Indonesia, one can find a warty pig painted with dark red pigment depicted on a stone wall, which constitutes as the earliest documented cave painting at around 43,500 B.C[1]. Similar cave paintings have been discovered across the globe, including French and Spanish coastlines, and have originated from thousands of years in the past[2]. In more recent times, cultural and societal factors throughout history have had powerful ramifications on visual art, such as the mythological[3] or religious[4] symbolism portrayed within ancient Greek sculptures and omnipresent frescoes illuminating cathedral ceilings throughout Europe. Moreover, art has been utilized as a tool for societal change with both beneficial and detrimental consequences, such as the Shepard Fairey's "Hope" poster supporting the Barack Obama 2008 presidential campaign[5] and the Nazi Plunder's public burning of art[6]. Visual art-making has taken on a plethora of mediums of both natural and man-made materials across a variety of disciplines ranging from architecture to graphic design.

[1] A. Brumm, A. A. Oktaviana, B. Burhan, B. Hakim, R. Lebe, J. -X, Zhao, P. H. Sulistyarto, M. Ririmasse, S. Adhityatama, I. Sumantri, & M. Aubert, *Oldest cave art found in Sulawesi,* in "Science Advances", *7*(3), 2021, pp. 1-12.
[2] J. Robb, *Art (Pre)History: Ritual, Narrative and Visual Culture in Neolithic and Bronze Age Europe*, in "Journal of Archaeological Method & Theory", 27(3), 2020, pp. 454-480.
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[4] P. Fingesten, *Toward a New Definition of Religious Art*, in "College art journal", 10(2), 1951, pp. 131-146.
[5] J. N. Williams, *The New Symbol of Hope for Fair Use: Shepard Fairey v. the Associated Press*, in "Landslide", 2(1), 2009, pp. 55-60.
[6] J. Petropoulos, *Art Historians and Nazi Plunder*, in "New England Review", 21(1), 2000, pp. 5-30.

Although aesthetics can be found within everyday objects[7], all artworks share a common entity: the aesthetic experience.

To date, numerous cognitive models explain the *visual* aesthetic experience, which denotes a viewer's engagement with a piece of visual artwork, such as a painting or sculpture. These models generally describe three distinct components: inputs, processing mechanisms, and outputs[8]. Inputs refer to the individual personality traits, social and cultural contexts, the emotional state of the viewers, an artworks information (e.g., an artist's statement), a viewer's art expertise, among others[9] [10]. Processing mechanisms refer to the bottom-up and top-down processes behind the perception of visual artwork with higher-level cognitive processes adjusting the visual information coded by lower-level brain areas[11]. Depending on the model, processing mechanisms include both subconscious and conscious processing[12] [13] with special consideration given to memory in both the implicit activation of schematic information[14] and the explicit attention-driven classification needed[15] for the recognition of objects present within a visual work of art. Moreover, emotion plays a vital role in the processing of artwork in that the viewer's emotional reaction to an artwork depends on the artwork's congruency to the viewer's self-image, current emotional state, and/or previous

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[15] M. Pelowski, P. S. Markey, M. Forster, G. Gerger, & H. Leder, *Move me, astonish me… delight my eyes and brain: The Vienna Integrated Model of top-down and bottom-up processes in Art Perception (VIMAP) and corresponding affective, evaluative, and neurophysiological correlates*, in "Physics of life reviews", 21, 2017, pp. 80-125.

emotional life experiences[16] [17]. Noteworthy as the most recent model, The Vienna Integrated Model of top-down and bottom-up processes in Art Perception[18] (VIMAP) proposes an interplay between a cognitive mastering stage, the discovery of meaning via associations to existing knowledge, and an evaluation stage, the understanding of an artwork's ambiguity, as a necessary late-stage processing mechanism for art perception. Although processing mechanisms may differ in one model versus another, the outputs describe mental and behavioral effects from the visual aesthetic experience which are generally compatible across theories[19] with utmost consideration given to the aesthetic judgment of *beauty*, aesthetic *appreciation*, and the experienced aesthetic *emotion*.

Accordingly, empirical research generally pertains to explaining the visual aesthetic experience through these outputs; however, some issues arise in the appropriateness of language. For example, the use of the word beauty to aesthetically judge artwork may be built upon semantically through prior activities and experiences[20] and may be related more towards the feeling of beauty as an aesthetic emotion[21] [22]. Although aesthetic appreciation is related to the liking of an artwork or the pleasure (even this dichotomy is debatable) associated with an artwork[23] [24], the use of the word appreciation may be explicit to a singular case of the visual aesthetic experience and may not be used as a general descriptor for all cases of the aesthetic experience as these all differ in their context[25]. Moreover, aesthetic appreciation may be explicitly related to the aesthetic emotions experienced throughout a viewer's engagement with an artwork, and these

[16] M. Pelowski, P. S. Markey, M. Forster, G. Gerger, & H. Leder, *Move me, astonish me… delight my eyes and brain: The Vienna Integrated Model of top-down and bottom-up processes in Art Perception (VIMAP) and corresponding affective, evaluative, and neurophysiological correlates*, cit., pp. 80-125.
[17] P. J. Silvia, & E. M. Brown, *Anger, disgust, and the negative aesthetic emotions: expanding an appraisal model of aesthetic experience*, cit., pp. 100-106.
[18] M. Pelowski, P. S. Markey, M. Forster, G. Gerger, & H. Leder, *Move me, astonish me… delight my eyes and brain: The Vienna Integrated Model of top-down and bottom-up processes in Art Perception (VIMAP) and corresponding affective, evaluative, and neurophysiological correlates*, cit., pp. 80-125.
[19] M. Pelowski, P. S. Markey, J. O. Lauring, & H. Leder, *Visualizing the Impact of Art: An Update and Comparison of Current Psychological Models of Art Experience*, cit., pp. 1-21.
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[23] I. Kant, *Critique of the power of judgment,* cit.
[24] W. Menninghaus, V. Wagner, E. Wassiliwizky, I. Schindler, J. Hanich, T. Jacobsen, & S. Koelsch, *What are aesthetic emotions?,* cit., pp. 171-195.
[25] L. Wittgenstein, C. Barrett, Y. Smythies, R. Rhees, & J. Taylor, *Lectures & conversations on aesthetics, psychology and religious belief*, Oxford: Basil Blackwell, 1987.

aesthetic emotions may be respective to different emotional categories, such as happiness and sadness[26]. Therefore, the language used to evaluate the visual aesthetic experience may be specific to the viewer, which poses an issue in empirical research investigating the visual aesthetic experience as a whole (i.e., from a representative sample).

Although the linguistics behind describing the aesthetic experience are of utmost consideration, the aim of this paper is not to necessarily criticize the methodology of empirical research explaining the visual aesthetic experience but is to provide an overview on and illuminate the common ground across disciplines to pave new roads for empirical research. Here, I will discuss the empirical findings concerning the visual aesthetic experience of visual artwork (henceforth regarded to as the aesthetic experience) in a neurological context. With each section incorporating the subsequent ones, I will discuss the intersection of different neurological and psychological accounts and will conclude with a philosophical account. To this end, I argue that empathetic processes delegating the viewer's felt emotions may be crucial for the viewer's aesthetic experience and should be given critical thought in future empirical research.

2. Neuroaesthetics Overview

The aesthetic experience has been explored by artists, art historians, philosophers, psychologists, and most recently, neuroscientists, who have established the field known as "neuroaesthetics" [27]. In the latter's perspective, interactions between different neural networks may mediate the aesthetic experience[28] [29] [30], and within these networks, cortical and subcortical areas underpinning the perception of an artwork's content work in concert to birth the aesthetic experience[31]. Although the aesthetic experience is

[26] W. Menninghaus, V. Wagner, E. Wassiliwizky, I. Schindler, J. Hanich, T. Jacobsen, & S. Koelsch, *What are aesthetic emotions?,* cit., pp. 171-195.
[27] H. Kawabata, & S. Zeki, *Neural correlates of beauty*, in "Journal of neurophysiology", 91(4), 2004, pp. 1699-1705
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[30] O. Vartanian, & M. Skov, *Neural correlates of viewing paintings: evidence from a quantitative meta-analysis of functional magnetic resonance imaging data*, in "Brain and cognition", 87, 2014, pp. 52-56.
[31] Z. Cattaneo, *Neural correlates of visual aesthetic appreciation: insights from non-invasive brain stimulation,* in "Experimental brain research", 238(1), 2020, pp. 1-16.

intricate and complex[32], it may partly surmise an interplay between both high- and low-level processes that are held within brain areas and their respective networks[33]. Accordingly, the interplay of the default mode (DMN) and executive control (ECN) networks may facilitate bottom-up and top-down effects attributed to the emergence of the aesthetic experience (Belfi et al., 2019; Cela-Conde et al., 2009, 2013; Vessel et al., 2019)[34] [35] [36] [37] . The ECN includes lateral frontal and anterior inferior parietal areas and facilitates in attentional and executive functional processes [38] [39]. The DMN includes midline and posterior inferior parietal areas and facilitates imagination, self-generated thought, and self-referential processing[40]. Both the ECN and DMN are comprised of frontal-striatal circuits with the striatum being related to reward computation (i.e., liking) and the prefrontal cortex (PFC) being related to executive control/functioning[41].

Concerning nodes of these networks, aesthetic appreciation, generally operationalized as liking, has been positively associated with frontal cortical areas including the left dorsolateral PFC[42] (DLPFC), the posterior parietal cortex[43], and visual

[32] M. Pelowski, P. S. Markey, J. O. Lauring, & H. Leder, *Visualizing the Impact of Art: An Update and Comparison of Current Psychological Models of Art Experience*, cit., pp. 1-21.
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cortical areas such as the lateral occipital complex[44] [45]. Likewise, frontal cortical activation has also been shown during the aesthetic judgment of beauty with the left DLPFC[46] [47] [48] [49], PFC[50] [51], frontomedian cortex [52] [53], and medial orbitofrontal cortex[54] [55] [56] showing higher engagement when participants aesthetically judged artwork as beautiful. In contrast, a reduced engagement of regions within the frontal lobe[57] and an increased engagement of the motor cortex [58] [59] was shown when participants aesthetically judged artwork as ugly, which suggests an action readied aversion effect during the viewing of artwork that is judged as ugly by the viewer (further critiqued in the subsequent sections). Therefore, the frontal lobe and its associated neural networks

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[43] Z. Cattaneo, C. Lega, C. Gardelli, L. B. Merabet, C. J. Cela-Conde, & M. Nadal, *The role of prefrontal and parietal cortices in esthetic appreciation of representational and abstract art: A TMS study,* in "NeuroImage", 99, 2014, pp. 443-450.
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[45] S. Lacey, H. Hagtvedt, V. M. Patrick, A. Anderson, R. Stilla, G. Deshpande, X. Hu, J. R. Sato, S. Reddy, & K. Sathian, *Art for reward's sake: visual art recruits the ventral striatum,* in "NeuroImage", *55*(1), 2011, pp. 420-433.
[46] C. J. Cela-Conde, F. J. Ayala, E. Munar, F. Maestú, M. Nadal, M. A. Capó, D. del Río, J. J. López-Ibor, T. Ortiz, C. Mirasso, & G. Marty, *Sex-related similarities and differences in the neural correlates of beauty,* cit., pp. 3847-3852.
[47] C. J. Cela-Conde, J. García-Prieto, J. J. Ramasco, C. R. Mirasso, R. Bajo, E. Munar, A. Flexas, F. del-Pozo, & F. Maestú, *Dynamics of brain networks in the aesthetic appreciation,* cit., pp. 10454-10461.
[48] C. J. Cela-Conde, G. Marty, F. Maestú, T. Ortiz, E. Munar, A. Fernández, M. Roca, J. Rosselló, & F. Quesney, *Activation of the prefrontal cortex in the human visual aesthetic perception*, in "Proceedings of the National Academy of Sciences of the United States of America", 101(16), 2004, pp. 6321-6325.
C. J. Cela-Conde, G. Marty, F. Maestú, T. Ortiz, E. Munar, A. Fernández, M. Roca, J. Rosselló, & F. Quesney, *Activation of the prefrontal cortex in the human visual aesthetic perception*, cit., pp. 6321-6325.
[49] T. Ishizu, & S. Zeki, *The brain's specialized systems for aesthetic and perceptual judgment,* in "The European journal of neuroscience", 37(9), 2013, pp. 1413-1420.
[50] C. J. Cela-Conde, G. Marty, F. Maestú, T. Ortiz, E. Munar, A. Fernández, M. Roca, J. Rosselló, & F. Quesney, *Activation of the prefrontal cortex in the human visual aesthetic perception*, cit., pp. 6321-6325.
[51] T. Jacobsen, R. I. Schubotz, L. Höfel, & D. Y. Cramon, *Brain correlates of aesthetic judgment of beauty*, in "NeuroImage", 29(1), 2006, pp. 276-285.
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[54] H. Kawabata, & S. Zeki, *Neural correlates of beauty*, cit., pp. 1699-1705.
[55] T. Ishizu, & S. Zeki, *Toward a brain-based theory of beauty,* cit., pp. 1-10.
[56] T. Ishizu, & S. Zeki, *The brain's specialized systems for aesthetic and perceptual judgment,* in "The European journal of neuroscience", 37(9), 2013, pp. 1413-1420.
[57] K. Nakamura, & H. Kawabata, *Transcranial Direct Current Stimulation over the Medial Prefrontal Cortex and Left Primary Motor Cortex (mPFC-lPMC) Affects Subjective Beauty but Not Ugliness*, in "Frontiers in human neuroscience", 9 (654), 2015, pp. 1-8.
[58] H. Kawabata, & S. Zeki, *Neural correlates of beauty*, cit., pp. 1699-1705.
[59] K. Nakamura, & H. Kawabata, *Transcranial Direct Current Stimulation over the Medial Prefrontal Cortex and Left Primary Motor Cortex (mPFC-lPMC) Affects Subjective Beauty but Not Ugliness*, cit., pp. 1-8.

may be significant for aesthetic appreciation and the aesthetic judgment of beauty, which implies partial common neurological underpinnings for both aesthetic appreciation and the aesthetic judgment of beauty[60]. In a similar vein, brain regions involved in reward computation and emotional processing, such as the caudate nucleus[61], cingulate gyrus[62] [63], insula [64] [65] [66] [67] [68] [69], and ventral striatum[70] [71] have been shown to be engaged during aesthetic appreciation and the aesthetic judgement of beauty. Although aesthetic appreciation and the aesthetic judgment of beauty employ different cognitive processes, these neurological findings suggest that the aesthetic appreciation of artwork and the aesthetic judgment of beauty of artwork may recruit similar brain areas that facilitate the experience of emotion.

Taken together, the aesthetic experience may depute the co-activation of neural networks and their associated nodes engendering reward computation and emotional processes, which may contribute to the both the viewer's judgement of beauty on and their appreciation of visual artwork. Indeed, aesthetic emotions have been posited to consist of two classes [72] [73]. The first class designates more ordinary emotions (e.g.,

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[60] M. Boccia, S. Barbetti, L. Piccardi, C. Guariglia, F. Ferlazzo, A. M. Giannini, & D. W. Zaidel, *Where does brain neural activation in aesthetic responses to visual art occur? Meta-analytic evidence from neuroimaging studies,* in "Neuroscience and biobehavioral reviews", *60*, 2016, pp. 65-71.
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[66] C. Di Dio, N. Canessa, S. F. Cappa, & G. Rizzolatti, *Specificity of esthetic experience for artworks: an FMRI study,* in "Frontiers in human neuroscience", 5(139), 2011, pp.1-14.
[67] C. Di Dio, E. Macaluso, & G. Rizzolatti, *The golden beauty: brain response to classical and renaissance sculptures*, in "PloS one", 2(11- e1201), 2007, pp. 1-9.
[68] T. Ishizu, & S. Zeki, *The brain's specialized systems for aesthetic and perceptual judgment,* cit., pp. 1413-1420.
[69] N. Osaka, T. Minamoto, K. Yaoi, & M. Osaka, *Neural Correlates of Delicate Sadness: An FMRI Study Based on the Neuroaesthetics of Noh Masks*, in "NeuroReport", 23(1), 2012, pp. 26-29.
[70] S. Lacey, H. Hagtvedt, V. M. Patrick, A. Anderson, R. Stilla, G. Deshpande, X. Hu, J. R. Sato, S. Reddy, & K. Sathian, *Art for reward's sake: visual art recruits the ventral striatum,* cit., pp. 420-433.
[71] E. A. Vessel, G. G. Starr, & N. Rubin, *The brain on art: intense aesthetic experience activates the default mode network,* cit., pp. 1-17.
[72] I. Kant, *Critique of the power of judgment,* cit.
[73] W. Menninghaus, V. Wagner, E. Wassiliwizky, I. Schindler, J. Hanich, T. Jacobsen, & S. Koelsch, *What are aesthetic emotions?,* cit., pp. 171-195.

sadness, happiness), while the second class is related to aesthetic feelings, such as the feeling of beauty. Therefore, the activation of neural networks and regions associated with emotion during the aesthetic judgement of beauty may be due to the viewer's feeling of beauty, while the activation of neural networks and regions associated with emotion during aesthetic appreciation (i.e., liking) may be due to the viewer's subjective felt pleasure associated with the emotions felt throughout the aesthetic experience.

Importantly, a problem arises within neuroscientific methodology in how the aesthetic experience is evaluated. Indeed, a clear criterion in asking the viewer to evaluate artwork has not been determined, with linguistic differences being utilized across methodological paradigms. For example, Jacobsen and colleagues[74] asked participants to indicate whether a pattern was beautiful on a dichotomous scale (yes vs. no) while Ishizu and Zeki[75] asked participants to group paintings into beautiful, indifferent, or ugly. Cattaneo and colleagues[76] asked participants to indicate if they liked a painting on a dichotomous scale (yes vs. no), while Lacey and colleagues[77] asked participants to rate on a 5-point scale how much they like a painting. Alongside the differences in the stimuli investigated, the differences in methodological paradigms for aesthetic evaluation may address different constructs of "beauty" or "appreciation", which may be reflected in the difference of neurological findings across studies. As noted previously, the aim of this paper is to not heavily critique the methodology of neuroscientific research investigating the aesthetic experience, especially since I have only scratched the surface concerning this linguistic debate[78] [79], which still stands strong today. Nonetheless, the differences in methodology across studies in neuroaesthetics should be strongly considered when interpreting their findings.

[74] T. Jacobsen, R. I. Schubotz, L. Höfel, & D. Y. Cramon, *Brain correlates of aesthetic judgment of beauty*, cit., pp. 276-285.
[75] T. Ishizu, & S. Zeki, *Toward a brain-based theory of beauty,* cit., pp. 1-10
[76] Z. Cattaneo, C. Lega, C. Ferrari, T. Vecchi, C. J. Cela-Conde, J. Silvanto, & M. Nadal, *The role of the lateral occipital cortex in aesthetic appreciation of representational and abstract paintings: a TMS study,* cit., pp. 44-53.
[77] S. Lacey, H. Hagtvedt, V. M. Patrick, A. Anderson, R. Stilla, G. Deshpande, X. Hu, J. R. Sato, S. Reddy, & K. Sathian, *Art for reward's sake: visual art recruits the ventral striatum,* cit., pp. 420-433.
[78] L. Wittgenstein, *Philosophical investigations: The English text of the third edition*, cit.
[79] L. Wittgenstein, C. Barrett, Y. Smythies, R. Rhees, & J. Taylor, *Lectures & conversations on aesthetics, psychology and religious belief*, cit.

3. Predictive Processing

As an up-and-coming theoretical account of the aesthetic experience, predictive processing theory suggests that the brain actively predicts sensory information regarding the aesthetic experience in hand[80] [81] [82]. These predictions are grounded on an interplay between low-sensory information and high-order cognitive processes to compare incoming sensory data with internal schematic representations. Incongruencies (i.e., ambiguity) within these comparisons represents prediction errors, which are constantly updated via predictive feedback loops to decipher an artwork's ambiguity. In other words, deciphering an artwork's ambiguity may be described as the processes behind identifying and understanding what is depicted by the artwork, regardless of its content. This may be seen as recognizing and understanding the facial configuration of the portraiture within Francis Bacon's *Self Portrait* (1971). Likewise, the VIMAP suggests that the interplay between explicit classification and cognitive mastery engenders a latter evaluation stage via feedback loops to clarify an artwork's ambiguity[83]. Therefore, the identification and classification of *what an artwork is* may occur through understanding an artwork's ambiguity via the updating of prediction errors through feedback loops between low-level and high-level brain areas, which may be partly attributed to the top-down and bottom-up processes employed by the DMN and ECN throughout the aesthetic experience [84] [85] [86] [87]. This interplay may provide an eventual sense of congruency between the viewer's perception and the artist's intentional portrayal of an artwork during the aesthetic experience.

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[80] L. Kesner, *The predictive mind and the experience of visual art work,* in "Frontiers in psychology", 5 (1417), 2014, pp. 1-13.
[81] S. Van de Cruys, *Affective value in the predictive mind,* in T. K. Metzinger, & W. Wiese, *Philosophy and predictive processsing*, MIND Group, 2017, pp. 1-21.
[82] S. Van de Cruys, & J. Wagemans, *Putting reward in art: A tentative prediction error account of visual art*, in i-Perception, 2(9), 2011, pp. 1035-1062.
[83] M. Pelowski, P. S. Markey, M. Forster, G. Gerger, & H. Leder, *Move me, astonish me… delight my eyes and brain: The Vienna Integrated Model of top-down and bottom-up processes in Art Perception (VIMAP) and corresponding affective, evaluative, and neurophysiological correlates*, cit., pp. 80-125.
[84] A. M. Belfi, E. A. Vessel, A. Brielmann, A. I. Isik, A. Chatterjee, H. Leder, D. G. Pelli, & G. G. Starr, *Dynamics of aesthetic experience are reflected in the default-mode network,* cit., pp. 584-597.
[85] C. J. Cela-Conde, F. J. Ayala, E. Munar, F. Maestú, M. Nadal, M. A. Capó, D. del Río, J. J. López-Ibor, T. Ortiz, C. Mirasso, & G. Marty, *Sex-related similarities and differences in the neural correlates of beauty,* cit., pp. 3847-3852.
[86] C. J. Cela-Conde, J. García-Prieto, J. J. Ramasco, C. R. Mirasso, R. Bajo, E. Munar, A. Flexas, F. del-Pozo, & F. Maestú, *Dynamics of brain networks in the aesthetic appreciation,* cit., pp. 10454-10461.
[87] E. A. Vessel, G. G. Starr, & N. Rubin, *The brain on art: intense aesthetic experience activates the default mode network,* cit., pp. 1-17.

Notably, the updating of prediction errors may be a transformative emotional experience, with an increase of prediction errors generating negative emotion and a decrease of prediction errors generating positive emotion[88] [89]. Thus, a lasting and higher rate of change in the updating of prediction errors may be positively emotional and rewarding[90] [91] [92] and vital to the intensity of an aesthetic experience. Indeed, Lacey and colleagues[93] found that viewing images of artwork vs. photographic replications of such artwork lead to a higher recruitment of the ventral striatum, which was driven by the activation of visual occipital areas responsible for the processing of low-sensory information. Therefore, the intensity of reward during the viewing of artwork may be higher when compared to more daily visual experiences and may be coupled to the activation of low-sensory areas. In a similar vein, the VIMAP states that, depending on the self-relevance and schematic congruency promoted by the cognitive mastery processing stage, the aesthetic experience's intensity of emotion and reward has transformative potential within the individual[94], which compliments the recruitment of the DMN and its role in self-referential processing[95]. Therefore, commonalties between accounts explaining the aesthetic experience lies within the viewer's emotional experience, which may have direct implications on the aesthetic appreciation of artwork. Indeed, researchers have utilized emotional priming to investigate how inducing emotional states unaware to the viewer influences their subsequent appreciation and emotional appraisal of representational paintings[96] and abstract stimuli[97] [98]. Accordingly, positive emotional primes had positive effects on appreciation

[88] S. Van de Cruys, *Affective value in the predictive mind,* cit., pp. 1-21.
[89] S. Van de Cruys, & J. Wagemans, *Putting reward in art: A tentative prediction error account of visual art*, cit., pp. 1035-1062.
[90] L. Kesner, *The predictive mind and the experience of visual art work,* cit., pp. 1-13.
[91] S. Van de Cruys, *Affective value in the predictive mind,* cit., pp. 1-21.
[92] S. Van de Cruys, & J. Wagemans, *Putting reward in art: A tentative prediction error account of visual art*, cit., pp. 1035-1062.
[93] S. Lacey, H. Hagtvedt, V. M. Patrick, A. Anderson, R. Stilla, G. Deshpande, X. Hu, J. R. Sato, S. Reddy, & K. Sathian, *Art for reward's sake: visual art recruits the ventral striatum,* cit., pp. 420-433.
[94] M. Pelowski, P. S. Markey, M. Forster, G. Gerger, & H. Leder, *Move me, astonish me… delight my eyes and brain: The Vienna Integrated Model of top-down and bottom-up processes in Art Perception (VIMAP) and corresponding affective, evaluative, and neurophysiological correlates*, cit., pp. 80-125.
[95] R. L. Buckner, J. R. Andrews-Hanna, & D. L. Schacter, *The brain's default network: anatomy, function, and relevance to disease,* cit., pp. 1-38.
[96] H. Höge, *The emotional impact on aesthetic judgments: An experimental investigation of a time-honored hypothesis*, in "Visual Arts Research", 10, 1984, pp. 37-48.
[97] A. Flexas, J. Rosselló, J. F. Christensen, M. Nadal, A. Olivera La Rosa, & E. Munar, *Affective priming using facial expressions modulates liking for abstract art,* in "PloS one", 8(11- e80154), 2013, pp. 1-6.

and emotional appraisal, while negative emotional primes had negative effects on appreciation and emotional appraisal. In conclusion, predictive processing theory agrees with neurological findings in that both emotional and reward-related processes are pivotal to the aesthetic experience and its corresponding outputs.

4. Embodiment and Empathy

For situations with an abundance of prediction errors and, consequently, strong negative emotion, the predictive brain may recruit the body's motor system to efficiently predict the external environment in hand[99]. Likewise, embodied simulation theory suggests that the individual may employ mirroring mechanisms to simulate actions, bodily sensations, and emotions induced by art [100] [101]. This compliments motor embodiment's, the engagement of motor neural areas during cognitive processes, and empathy's, the ability to understand another person's emotions, recruitment of the mirror neuron system, which is employed for the execution and perception of an action [102]. Moreover, the notion of *Einfühlung*, or "feeling into", is commonly deemed as empathy and marks a viewer's physical reaction towards an artwork via bodily perspective taking, which facilitates the viewer's understanding of the emotion depicted within the artwork[103] [104]. Therefore, individuals may empathetically engage with artwork through an inward imitation of the actions and emotions depicted, which may occur through the activation of a viewer's internal schematic representations as represented by the mirror neuron system[105] [106].

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[98] G. Gerger, M. Pelowski, & T. Ishizu, *Does priming negative emotions really contribute to more positive aesthetic judgments? A comparative study of emotion priming paradigms using emotional faces versus emotional scenes and multiple negative emotions with fEMG,* in "Emotion (Washington, D.C.)", 19(8), 2019, pp. 1396-1413.
[99] S. Van de Cruys, *Affective value in the predictive mind,* cit., pp. 1-21.
[100] D. Freedberg, & V. Gallese, *Motion, emotion and empathy in esthetic experience*, in "Trends in cognitive sciences", 11(5), 2007, pp. 197-203.
[101] V. Gallese, *Embodied Simulation. Its Bearing on Aesthetic Experience and the Dialogue Between Neuroscience and the Humanities*, in "Gestalt theory", 41(2), 2019, pp.113-127.
[102] N. M. Thompson, A. Uusberg, J. J. Gross, & B. Chakrabarti, *Empathy and emotion regulation: an integrative account,* in "Progress in Brain Research", 247, 2019, pp. 273-304.
[103] J. Ganczarek, T. Hünefeldt, & M. Olivetti Belardinelli, *From "Einfühlung" to empathy: exploring the relationship between aesthetic and interpersonal experience*, in "Cognitive processing", 19(2), 2018, pp. 141-145.
[104] R. Vischer, *On the Optical Sense of Form: A Contribution to Aesthetics*, in H. F. Mallgrave, E. Ikonomou, (eds), *Empathy, Form and Space. Problems in German Aesthetics 1873-1893*, Los Angeles: University of Chicago Press, 1994, pp. 89-123.
[105] D. Freedberg, & V. Gallese, *Motion, emotion and empathy in esthetic experience*, cit., pp. 197-203.

Indeed, emotions elicited by art can be attributed to the self-reported activation and deactivation of bodily sensations regardless of the artwork's content[107]. Furthermore, corticospinal excitability (CSE), an indicator of bodily engagement, can be measured by stimulating the motor cortex with transcranial magnetic stimulation[108]. An increased CSE generally indicates an increased recruitment of body, while a decreased CSE generally indicates a reduced recruitment of the body. Prior evidence shows an association between CSE and emotion with negative emotional stimuli mediating higher CSE, such as threatening[109], fearful[110], and disgusting[111] [112] stimuli. However, the type of negative emotion is important as there is an inverse association between depressive mood and CSE[113] with further evidence showing no effect of sadness on CSE[114]. Moreover, CSE is reduced during the perception of painful stimuli, suggesting a suppression of bodily recruitment due to empathetic cognitive processes associated with distancing oneself from such pain[115]. Nonetheless, mimicry of painful facial expressions was shown to increase beauty judgement ratings for painful vs. neutral portraits and was positively modulated by art expertise and empathetic ability[116] and may be reflected by

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[106] V. Gallese, *Embodied Simulation. Its Bearing on Aesthetic Experience and the Dialogue Between Neuroscience and the Humanities*, cit., pp.113-127.
[107] G. Schino, L. -M. van Klaveren, H. G. Gallegos González, & R. F. A. Cox, *Applying bodily sensation maps to art-elicited emotions: An explorative study*, in "Psychology of Aesthetics, Creativity, and the Arts", Advance online publication, 2021.
[108] V. Di Lazzaro, & U. Ziemann, *The contribution of transcranial magnetic stimulation in the functional evaluation of microcircuits in human motor cortex*, in "Frontiers in neural circuits", 7(18), 2013, pp. 1-9.
[109] P. M. Gough, G. C. Campione, & G. Buccino, *Fine tuned modulation of the motor system by adjectives expressing positive and negative properties*, in "Brain and language", 125(1), 2013, pp. 54-59.
[110] D. J. Schutter, D. Hofman, & J. Van Honk, *Fearful faces selectively increase corticospinal motor tract excitability: a transcranial magnetic stimulation study*, in "Psychophysiology", 45(3), 2008, pp. 345-348.
[111] G. Lagravinese, A. Bisio, A. R. De Ferrari, E. Pelosin, P. Ruggeri, M. Bove, & L. Avanzino, *An Emotion-Enriched Context Influences the Effect of Action Observation on Cortical Excitability,* in "Frontiers in human neuroscience", 11(504), 2017, pp. 1-11.
[112] C. M. Vicario, R. D. Rafal, S. Borgomaneri, R. Paracampo, A. Kritikos, & A. Avenanti, *Pictures of disgusting foods and disgusted facial expressions suppress the tongue motor cortex*, in "Social cognitive and affective neuroscience", 12(2), 2017, pp. 352-362.
[113] D. J. Oathes, & W. J. Ray, *Depressed mood, index finger force and motor cortex stimulation: a transcranial magnetic stimulation (TMS) study*, in "Biological psychology", 72(3), 2006, pp. 271-277.
[114] G. Lagravinese, A. Bisio, A. R. De Ferrari, E. Pelosin, P. Ruggeri, M. Bove, & L. Avanzino, *An Emotion-Enriched Context Influences the Effect of Action Observation on Cortical Excitability,* in "Frontiers in human neuroscience", 11(504), 2017, pp. 1-11.
[115] A. Avenanti, I. Minio-Paluello, I. Bufalari, & S. M. Aglioti, *Stimulus-driven modulation of motor-evoked potentials during observation of others' pain*, in "NeuroImage", *32*(1), 2006, pp. 316-324.
[116] M. Ardizzi, F. Ferroni, F. Siri, M. A. Umiltà, A. Cotti, M. Calbi, E. Fadda, D. Freedberg, & V. Gallese, *Beholders' sensorimotor engagement enhances aesthetic rating of pictorial facial expressions of pain,* in "Psychological Research", *84*(2), 2020, pp. 370-379.

the recruitment of mirror neuron system[117]. In line with predictive processing theory[118], this specific recruitment of the mirror neuron system in negatively emotional artwork may partly explain the heightened recruitment of motor brain areas during the aesthetic experience of artwork judged to be ugly[119] [120]; the feeling of ugliness may arise from a negatively emotional experience and employ more bodily processes in comparison to the feeling of beauty, which may arise from a positively emotional experience and employ less bodily processes.

Of utmost importance, CSE has been used as a tool to specifically investigate the recruitment of the bodily processes during the aesthetic experience. When an individual viewed Adam's figural arm gesture in Michelangelo's *Expulsion from Paradis* (1508-1512), they displayed significantly higher CSE in comparison to a photographic reproduction of the same artwork[121]. Higher CSE was found during the viewing of dynamic *figural* representational artwork, and the positive relation between CSE amplitude and aesthetic appreciation was fully mediated by perceived dynamism[122]. Therefore, the aesthetic appreciation of such dynamic artwork may be dependent on the recruitment of bodily processes. Furthermore, higher CSE during the viewing of *non-figural* representational paintings was associated with prior training in replicating brushstroke movements inherent to the stylistic method used to produce such paintings, and a negative association was found between CSE and aesthetic appreciation, which was partly mediated by a higher empathetic disposition[123]. In line with empathetic ability positively modulating the effect of bodily mimicry on aesthetic judgement[124], individuals with a stronger ability to understand another's emotions may experience

[117] M. Ardizzi, F. Ferroni, M. A. Umiltà, C. Pinardi, A. Errante, F. Ferri, E. Fadda, & V. Gallese, *Visceromotor roots of aesthetic evaluation of pain in art: an fMRI study,* in "Social cognitive and affective neuroscience", *16*(11), 2021, pp. 1113-1122.
[118] S. Van de Cruys, *Affective value in the predictive mind,* cit., pp. 1-21.
[119] H. Kawabata, & S. Zeki, *Neural correlates of beauty*, cit., pp. 1699-1705.
[120] K. Nakamura, & H. Kawabata, *Transcranial Direct Current Stimulation over the Medial Prefrontal Cortex and Left Primary Motor Cortex (mPFC-lPMC) Affects Subjective Beauty but Not Ugliness*, cit., pp. 1-8.
[121] F. Battaglia, S. H. Lisanby, S. H., & D. Freedberg, *Corticomotor Excitability during Observation and Imagination of a Work of Art,* in "Frontiers in human neuroscience", 5(79), 2011, pp. 1-6.
[122] F. Fiori, E. Plow, M. L. Rusconi, & Z. Cattaneo, *Modulation of corticospinal excitability during paintings viewing: A TMS study,* in "Neuropsychologia", 149 (107644), 2020, pp. 1-9.
[123] A. Finisguerra, L. F. Ticini, L. P. Kirsch, E. S. Cross, S. A. Kotz, & C. Urgesi, *Dissociating embodiment and emotional reactivity in motor responses to artworks*, in "Cognition", 212(104663), 2021, pp. 1-15.
[124] M. Ardizzi, F. Ferroni, F. Siri, M. A. Umiltà, A. Cotti, M. Calbi, E. Fadda, D. Freedberg, & V. Gallese, *Beholders' sensorimotor engagement enhances aesthetic rating of pictorial facial expressions of pain,* cit., pp. 370-379.

more reward during the aesthetic experience. Considerably, the viewer may be able to feel into artwork with and without human figures[125] [126], such as empathetically engaging with visual artwork solely depicting objects[127]. Therefore, the intersection of emotion, empathy, and bodily processes proves pivotal to the aesthetic experience and may play a significant role in the viewer's aesthetic appreciation and their judgment of beauty.

5. Philosophical considerations

Although past research within neuroaesthetics have investigated ugly artwork, the differences in such methodology should again be mentioned. Indeed, Ardizzi and colleagues[128] asked participants to judge the beauty of artwork on a 5-point scale, while Nakamura and Kawabata[129] asked participants to judge the ugliness of artwork on a 9-point scale. Although there were some commonalities in the aims of the two research groups, the classification of ugliness and its reference to negative emotion, such as pain[130], deems too muddled for concrete interpretations pertaining to the neurological findings considering ugly artwork. I will now move away from the classification of ugly artwork and will discuss specifically within the realm of negatively emotional artwork.

Accordingly, current philosophical debate over the aesthetic experience concerns the enjoyment and pleasure of negatively emotional artwork, such as those depicting pain, sadness, and tragedy[131]. As a viewer, the individual observes, from a *distance*, the negatively emotional content depicted within artwork, such as the cannibalism depicted within Goya's *Saturn Devouring One of his Sons* (1820-1823). This argument complements The Distancing-Embracing model of the enjoyment of negative emotions

[125] J. Ganczarek, T. Hünefeldt, & M. Olivetti Belardinelli, *From "Einfühlung" to empathy: exploring the relationship between aesthetic and interpersonal experience*, cit., pp. 141-145.
[126] R. Vischer, *On the Optical Sense of Form: A Contribution to Aesthetics*, cit., pp. 89-123.
[127] D. Freedberg, & V. Gallese, *Motion, emotion and empathy in esthetic experience*, cit., pp. 197-203.
[128] M. Ardizzi, F. Ferroni, M. A. Umiltà, C. Pinardi, A. Errante, F. Ferri, E. Fadda, & V. Gallese, *Visceromotor roots of aesthetic evaluation of pain in art: an fMRI study,* cit., pp. 1113-1122.
[129] K. Nakamura, & H. Kawabata, *Transcranial Direct Current Stimulation over the Medial Prefrontal Cortex and Left Primary Motor Cortex (mPFC-lPMC) Affects Subjective Beauty but Not Ugliness*, cit., pp. 1-8.
[130] M. Ardizzi, F. Ferroni, M. A. Umiltà, C. Pinardi, A. Errante, F. Ferri, E. Fadda, & V. Gallese, *Visceromotor roots of aesthetic evaluation of pain in art: an fMRI study,* cit., pp. 1113-1122.
[131] M. Mazzocut-Mis, *The Pleasure of Weeping: The Novelty of a Research,* in P. Giacomoni, N. Valentini, S. Dellantonio, (eds) *The Dark Side: Philosophical Reflections on the "Negative Emotions."* Studies in the History of Philosophy of Mind, vol 25. Springer, Cham, 2021, pp. 159-175.

in art reception[132], which states that the interplay of psychological distancing and embracing with negatively emotional artwork lies within schematic representations facilitating the viewer's understanding that they are, indeed, not experiencing real-life events but artworks depicting negatively emotional content. As mentioned previously, "feeling into" is commonly conceptualized as empathy; however, it can be further classified as aesthetic empathy, explicitly "feeling into" human artefacts (i.e., paintings), and interpersonal empathy, explicitly "feeling into" real-life situations[133] [134]. Through psychological distance, viewers may positively embrace such negatively emotional content via an aesthetic empathetic engagement[135] [136] [137] [138], which leads to the pleasurable aesthetic experience of artworks depicting negative emotions.

Therefore, the aesthetic experience of negatively emotional artwork is not of experiencing tragic or negative events firsthand; it is a quasi-experience by experiencing these depicted events through a secondary source (i.e., a painting), which further classifies the emotions from the aesthetic experience as quasi-emotions[139] [140]. Accordingly, genuine emotions come from real situations, while quasi-emotions come from situations in fictional (i.e., phantasical) contexts. Although presented only according to the scope of the paper, this calls the question of the image[141] [142], which is never perceived in the present as it is a fabrication of an illusory object. Thus, the *image thing* may be seen as a physical image, such as a canvas, while the *image object*, also known as the representing image, represents and depicts the object on the physical image, such as the painting on the canvas. Thus, the *image object does not exist* and will

[132] W. Menninghaus, V. Wagner, J. Hanich, E. Wassiliwizky, T. Jacobsen, & S. Koelsch, *The Distancing-Embracing model of the enjoyment of negative emotions in art reception*, in "Behavioral and Brain Sciences", 40(E347), 2017, pp. 1-63.
[133] J. Ganczarek, T. Hünefeldt, & M. Olivetti Belardinelli, *From "Einfühlung" to empathy: exploring the relationship between aesthetic and interpersonal experience*, cit., pp. 141-145.
[134] R. Vischer, *On the Optical Sense of Form: A Contribution to Aesthetics*, cit., pp. 89-123.
[135] D. Freedberg, & V. Gallese, *Motion, emotion and empathy in esthetic experience*, cit., pp. 197-203.
[136] V. Gallese, *Embodied Simulation. Its Bearing on Aesthetic Experience and the Dialogue Between Neuroscience and the Humanities*, cit., pp.113-127.
[137] J. Ganczarek, T. Hünefeldt, & M. Olivetti Belardinelli, *From "Einfühlung" to empathy: exploring the relationship between aesthetic and interpersonal experience*, cit., pp. 141-145.
[138] R. Vischer, *On the Optical Sense of Form: A Contribution to Aesthetics*, cit., pp. 89-123.
[139] M. Mazzocut-Mis, *The Pleasure of Weeping: The Novelty of a Research,* cit., pp. 159-175.
[140] C. Rozzoni, *Am I Truly Feeling This? Quasi-Emotions and Quasi-Values in Cinematic Experience*, in "Phenomenology of Phantasy and Emotion", 2022, pp.181-205.
[141] E. Husserl, *Phantasy, Image Consciousness, and Memory (1898-1925).* Dordrecht, The Netherlands: Springer, 2005.
[142] C. Rozzoni, *Seeing the unreal: Husserlian Insights into the Nature of Images*, in "Kunstiteaduslikke Uurimusi", 29(3-4), 2020, pp. 57-70.

never exist as it comes from imagination. Accordingly, the *image subject*, what is represented and depicted by the image object (i.e., a fish being represented by the painted image of a fish) *can exist*, yet this depends whether the image subject is real or phantasical (a fish from imagination or a fish that has been present on earth). Therefore, image subjects are not present in real life, but are *presentified* within the physical image. However, persons can believe in the subject presentified within the image, and in these instances, the distance between the viewer and the image object may at times be too little to positively embrace negative emotional artwork.

Accordingly, the experience of quasi-emotions depends on either being aware or not aware of the *illusion as not being real*[143]. A cyclic notion between illusion and awareness allows the viewer to experience the emotion of the depicted image, such as visual artwork. Being unaware of and believing in the illusion mediates the emotional experience; however, being aware of and not believing in the illusion distances the viewer and allows the acceptance of experienced emotions as quasi-emotions. This interplay can be further explained by the doubling of ego[144]. The real ego is the perception of the present, the real world, while the phantasy ego is the perception of the presentified, the imaginary world. Like the cyclic notion of illusion and awareness, the real ego grounds the viewer within the real world, while the phantasy ego facilitates the viewer's experience of the presentified imaginary world. Without awareness and the real ego, the viewer may become entirely immersed in the artwork's depicted illusion by completely experiencing such through the phantasy ego, which results in the belief that the experienced emotions are real. Conversely, without the illusion and phantasy ego, a viewer would not be able to embrace and experience the emotions depicted by the artwork. Through the communication of these egos modulating the awareness of the illusion, viewers may become immersed, yet not completely, in the image depicted by artwork and experience the associated quasi-emotions.

Hence, empathy may imply that viewers are not explicitly experiencing the emotions *themselves*, but they are *also* recognizing and understanding, or "feeling into", *another's* emotion. In this vein, aesthetic empathy may reflect a viewer's engagement with an artwork as *not* an illusion via the real ego, while interpersonal empathy may

[143] M. Mazzocut-Mis, *The Pleasure of Weeping: The Novelty of a Research,* cit., pp. 159-175.
[144] C. Rozzoni, *Am I Truly Feeling This? Quasi-Emotions and Quasi-Values in Cinematic Experience*, cit., pp.181-205.

reflect the viewer's engagement with an artwork as an illusion via the phantasy ego. As such, aesthetic empathy may mediate the viewer's understanding that they are engaging with another thing (i.e., the presentified) by not being submerged within the illusion via the real ego. Yet, interpersonal empathy may mediate the submersion of the viewer within the illusion, which leads to the viewer's believing that the presentified is real via the phantasy ego. The experience of quasi-emotions during aesthetic engagement may be delegated by aesthetic and interpersonal empathy, which represent the communication of egos underlying the awareness of the illusion. Therefore, the activation of the mirror neuron system for the inward imitation of the actions and emotions depicted within artwork [145] may reflect the viewer's recognition and understanding that they are not solely engaging with an artwork as a human artefact via aesthetic empathy but that they are also engaging with an artwork as a real-life event via interpersonal empathy.

Moreover, the induction of the phantasy ego gives the viewer novel perspectives, and in effect, new variations of the real ego, as these two egos are *not severed* and *consistently interplay* throughout the aesthetic experience[146], which may reflect the interplay of the DMN[147] and ECN[148] [149] and their roles in imagination and attention, respectively. In other words, the DMN and its role in imagination and self-referential processing may partly represent the phantasy ego, and the ECN and its role in attention and executive functioning may partly represent the real ego. Although speculative, the interplay of the DMN and ECN during the aesthetic experience may reflect the interplay of the real and phantasy egos. Through the inductions of new variations of the real ego from this interplay, the viewer may take novel perspectives, which may allow the viewer to be open to new values and meanings. This gives reason for the transformative capabilities of the aesthetic experience, which may be due to the updating of schematic

[145] D. Freedberg, & V. Gallese, *Motion, emotion and empathy in esthetic experience*, cit., pp. 197-203.
[146] C. Rozzoni, *Am I Truly Feeling This? Quasi-Emotions and Quasi-Values in Cinematic Experience*, cit., pp.181-205.
[147] R. L. Buckner, J. R. Andrews-Hanna, & D. L. Schacter, *The brain's default network: anatomy, function, and relevance to disease,* cit., pp. 1-38.
[148] W.W. Seeley, V. Menon, A. F. Schatzberg, J. Keller, G. H. Glover, H. Kenna, A. L. Reiss, & M. D. Greicius, *Dissociable intrinsic connectivity networks for salience processing and executive control,* cit., pp. 2349-2356.
[149] M. L. Waskom, D. Kumaran, A. M. Gordon, J. Rissman, & A. D. Wagner, *Frontoparietal representations of task context support the flexible control of goal-directed cognition*, cit., pp. 10743-10755.

representations[150] [151] [152] via top-down and bottom-up effects employed during art perception[153]. Moreover, humans desire novelty, and in the case of negatively emotional artwork, the experience of the novel immorality, such as a painful experience, is in itself desirable as it gives viewers knowledge and experiences that are normally not experienced firsthand[154]. However, if negatively emotional artwork is experienced too closely, not at a psychological distance, then the pleasure diminishes, and negativity dominates the aesthetic experience[155] [156] [157]. Thus, both aesthetic and interpersonal empathy[158] [159] may be attributed to the recruitment of the mirror neuron system during the aesthetic experience [160] [161], which, alongside the interplay of the DMN and ECN[162] [163] [164] [165]provides a sense of congruency (i.e., updating of prediction errors) between the artwork (i.e., external environment) and the viewer's schematic representations [166] [167] [168] via the distance mediated by the doubling of ego[169] and the cyclic notion of

[150] L. Kesner, *The predictive mind and the experience of visual art work,* cit., pp. 1-13.
[151] S. Van de Cruys, *Affective value in the predictive mind,* cit., pp. 1-21.
[152] S. Van de Cruys, & J. Wagemans, *Putting reward in art: A tentative prediction error account of visual art*, cit., pp. 1035-1062.
[153] M. Pelowski, P. S. Markey, M. Forster, G. Gerger, & H. Leder, *Move me, astonish me… delight my eyes and brain: The Vienna Integrated Model of top-down and bottom-up processes in Art Perception (VIMAP) and corresponding affective, evaluative, and neurophysiological correlates*, cit., pp. 80-125.
[154] M. Mazzocut-Mis, *The Pleasure of Weeping: The Novelty of a Research,* cit., pp. 159-175.
[155] M. Mazzocut-Mis, *The Pleasure of Weeping: The Novelty of a Research,* cit., pp. 159-175.
[156] W. Menninghaus, V. Wagner, J. Hanich, E. Wassiliwizky, T. Jacobsen, & S. Koelsch, *The Distancing-Embracing model of the enjoyment of negative emotions in art reception*, cit., pp. 1-63.
[157] M. Pelowski, P. S. Markey, M. Forster, G. Gerger, & H. Leder, *Move me, astonish me… delight my eyes and brain: The Vienna Integrated Model of top-down and bottom-up processes in Art Perception (VIMAP) and corresponding affective, evaluative, and neurophysiological correlates*, cit., pp. 80-125.
[158] J. Ganczarek, T. Hünefeldt, & M. Olivetti Belardinelli, *From "Einfühlung" to empathy: exploring the relationship between aesthetic and interpersonal experience*, cit., pp. 141-145.
[159] R. Vischer, *On the Optical Sense of Form: A Contribution to Aesthetics*, cit., pp. 89-123.
[160] D. Freedberg, & V. Gallese, *Motion, emotion and empathy in esthetic experience*, cit., pp. 197-203.
[161] V. Gallese, *Embodied Simulation. Its Bearing on Aesthetic Experience and the Dialogue Between Neuroscience and the Humanities*, cit., pp.113-127.
[162] A. M. Belfi, E. A. Vessel, A. Brielmann, A. I. Isik, A. Chatterjee, H. Leder, D. G. Pelli, & G. G. Starr, *Dynamics of aesthetic experience are reflected in the default-mode network,* cit., pp. 584-597.
[163] C. J. Cela-Conde, F. J. Ayala, E. Munar, F. Maestú, M. Nadal, M. A. Capó, D. del Río, J. J. López-Ibor, T. Ortiz, C. Mirasso, & G. Marty, *Sex-related similarities and differences in the neural correlates of beauty,* cit., pp. 3847-3852.
[164] C. J. Cela-Conde, J. García-Prieto, J. J. Ramasco, C. R. Mirasso, R. Bajo, E. Munar, A. Flexas, F. del-Pozo, & F. Maestú, *Dynamics of brain networks in the aesthetic appreciation,* cit., pp. 10454-10461.
[165] E. A. Vessel, G. G. Starr, & N. Rubin, *The brain on art: intense aesthetic experience activates the default mode network,* cit., pp. 1-17.
[166] L. Kesner, *The predictive mind and the experience of visual art work,* cit., pp. 1-13.
[167] S. Van de Cruys, *Affective value in the predictive mind,* cit., pp. 1-21.
[168] S. Van de Cruys, & J. Wagemans, *Putting reward in art: A tentative prediction error account of visual art*, cit., pp. 1035-1062.
[169] C. Rozzoni, *Am I Truly Feeling This? Quasi-Emotions and Quasi-Values in Cinematic Experience*, cit., pp.181-205.

illusion and awareness[170]. Through this distanced empathetic mechanism[171], the viewers gain pleasure, even in the case of negatively emotional artwork, as they are not experiencing the artwork explicitly as a firsthand event. In line with the coactivation of neural areas associated with emotion and reward during the aesthetic experience of visual artwork[172] [173] [174] [175] [176] [177] [178] [179] [180] [181], pleasure may be derived from quasi-emotions in that artworks depicting all sorts of emotions may be appreciated by the employment of empathetic processes.

6. Conclusions

Neural underpinnings of the visual aesthetic experience have grounded the aesthetic judgment of beauty, aesthetic appreciation, and emotional appraisal of visual artworks within distinct neural networks and their nodes; however, the faults in methodological paradigms should be strongly considered when interpreting the results of these studies. Nonetheless, the interplay of bottom-up and top-down effects attributed to the neurological findings behind the aesthetic experience may facilitate predictive processes modulating the experienced reward and emotion during the observation of visual artwork. Moreover, embodied cognitive processes associated with empathy have been shown to play a pivotal role in the aesthetic experience. As such, the viewer may

[170] M. Mazzocut-Mis, *The Pleasure of Weeping: The Novelty of a Research,* cit., pp. 159-175.
[171] A. Avenanti, I. Minio-Paluello, I. Bufalari, & S. M. Aglioti, *Stimulus-driven modulation of motor-evoked potentials during observation of others' pain*, cit., pp. 316-324.
[172] G. C. Cupchik, O. Vartanian, A. Crawley, & D. J. Mikulis, *Viewing artworks: contributions of cognitive control and perceptual facilitation to aesthetic experience,* cit., pp. 84-91.
[173] C. Di Dio, M. ArdizzI, D. Massaro, G. Di Cesare, G. Gilli, A. Marchetti, & V. Gallese, *Human, Nature, Dynamism: The Effects of Content and Movement Perception on Brain Activations during the Aesthetic Judgment of Representational Paintings*, cit.,1-19.
[174] C. Di Dio, N. Canessa, S. F. Cappa, & G. Rizzolatti, *Specificity of esthetic experience for artworks: an FMRI study,* cit., pp.1-14.
[175] C. Di Dio, E. Macaluso, & G. Rizzolatti, *The golden beauty: brain response to classical and renaissance sculptures*, cit., pp. 1-9.
[176] T. Ishizu, & S. Zeki, *The brain's specialized systems for aesthetic and perceptual judgment,* cit., pp. 1413-1420.
[177] R. H. Jacobs, R. Renken, & F. W. Cornelissen, *Neural correlates of visual aesthetics–beauty as the coalescence of stimulus and internal state*, cit. pp. 1-8.
[178] S. Lacey, H. Hagtvedt, V. M. Patrick, A. Anderson, R. Stilla, G. Deshpande, X. Hu, J. R. Sato, S. Reddy, & K. Sathian, *Art for reward's sake: visual art recruits the ventral striatum,* cit., pp. 420-433.
[179] N. Osaka, T. Minamoto, K. Yaoi, & M. Osaka, *Neural Correlates of Delicate Sadness: An FMRI Study Based on the Neuroaesthetics of Noh Masks*, cit., pp. 26-29.
[180] O. Vartanian, & M. Skov, *Neural correlates of viewing paintings: evidence from a quantitative meta-analysis of functional magnetic resonance imaging data*, cit., pp. 52-56.
[181] E. A. Vessel, G. G. Starr, & N. Rubin, *The brain on art: intense aesthetic experience activates the default mode network,* cit., pp. 1-17.

employ the mirror neuron system to feel into an artwork and experience their depicted emotions; moreover, this indicates an experience of quasi-emotions during the observation of artwork in that the viewer is not experiencing emotions solely on a firsthand basis. Therefore, the experience of quasi-emotions may come from aesthetically engaging with an artwork from a psychological distance, all the while, fostering pleasure and reward within the viewer. This psychological distance behind the experience of quasi-emotions may be mediated by the doubling of real and phantasy egos, which facilitates the cyclic notion of illusion and awareness. Through distance via the doubling of egos, aesthetic and interpersonal empathy may allow the viewer to experience artwork themselves and as another thing, which may be mediated by the neural networks and their nodes underlying predictive processing and the embodiment throughout the aesthetic experience. Although recent research within neuroaesthetics has progressed in the following direction (e.g., Ardizzi and colleagues)[182], future research should move away from the outputs of aesthetic appreciation and the aesthetic judgement of beauty and move towards the types of emotions felt by the viewer while engaging with a range artwork depicting different emotional content (e.g., happiness, sadness). Given the employment empathetic processes during the aesthetic experience, future research should also investigate the recruitment of the mirror neuron system and other bodily processes (e.g., through CSE methodology) occurring throughout the aesthetic experience of such artwork. In brief, the emotions felt by the viewer and empathetic processes present during the aesthetic experience should be strongly considered in future empirical research to promote the unification of accounts across a wide breadth of disciplines.

[182] M. Ardizzi, F. Ferroni, M. A. Umiltà, C. Pinardi, A. Errante, F. Ferri, E. Fadda, & V. Gallese, *Visceromotor roots of aesthetic evaluation of pain in art: an fMRI study,* cit., pp. 1113-1122.