

**Exploring the Cognitive Mechanisms Underlying Perceptual Fluency-Disfluency and
Aesthetic Responses to Unappealing Visual Art**

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Abstract

Throughout this literature review, the cognitive mechanisms of perceptual fluency-disfluency are examined, which further extends to the exploration of aesthetic response to visual art.

Specifically, I will examine the effects of fluency and the processes involved when seeing disfluent art. This review is intended to provide a comprehensive understanding of how these cognitive processes shape aesthetical judgements. During the review, the dual-process model is highlighted: automatic and deliberate cognitive mechanisms structuring aesthetic preferences. In the end, valuable insights for art and design education are offered, suggesting practical applications for enhancing visual art engagement.

Introduction

The concept of processing fluency is defined as the ease with which information is processed by the cognitive system. This concept is deeply implicated in various domains, including aesthetics. Reber, Winkielman, and Schwarz (1998) provide fundamental insights of how fluency affects judgements and decisions: information that is easy to process typically results in more positive evaluations, a phenomenon that is crucial in the domain of aesthetics.

As discussed by Chatterjee (2014), the aesthetic brain processes visual stimuli through a balance of cognitive and emotional responses, which hugely affects how we experience and evaluate art. Both automatic and deliberate mechanisms are shaping our aesthetic judgements. The dual-

process model explicates why certain artworks are instantly liked when others require more cognitive loads to be appreciated.

During the process of cognitive appraisals, the complexity and novelty of the artwork is evaluated, which results in interest for artworks. Silvia (2005) stresses that our art experience is deeply rooted in how we evaluate its attributes, thus influencing our emotional response and overall appreciation towards them. By understanding the processes, we could comprehend how human interacts with visual art, particularly when complex or challenging art is present.

This literature review is aiming to investigate the cognitive mechanisms that influence people's aesthetic judgements through the concept of perceptual fluency and disfluency. Specifically, the underlying mechanisms of how the ease of processing affects our aesthetic evaluations, particularly when seeing complex or disfluent art, is explored. As Reber, Schwarz, and Winkielman (2004) suggest, the degree of fluency to process visual information could significantly shape our aesthetical preferences. Chatterjee (2014) elaborates that a deeper understanding of these cognitive mechanisms could enhance our comprehension of aesthetic appreciation and its underlying neural process.

Objectives:

1. Explore the effects of perceptual fluency on aesthetic judgments.
2. Investigate the cognitive and emotional responses to disfluent or complex art.
3. Examine the dual-process model in aesthetic preferences.
4. Provide practical implications for art and design education.

Theoretical Framework

Processing fluency theory

Fluency, as explored by Reber, Winkielman, and Schwarz (1998), refers to the ease with which perceptual or conceptual information is processed. This ease can result from various factors including repetition, visual clarity, symmetry, and prior exposure. Perceptual fluency is often influenced by the clarity and simplicity of stimuli, while conceptual fluency involves the ease of understanding and integrating new information with existing knowledge. High fluency is associated with positive affective responses because it signals the efficient functioning of the cognitive system, leading to increased liking and preference for the stimulus. For instance, stimuli that are easily recognizable or require minimal cognitive effort to process are often judged more favorably. This principle applies broadly across different sensory modalities and types of stimuli, underpinning many aspects of aesthetic appreciation. According to Reber, Schwarz, and Winkielman (2004), a high level of fluency typically leads to good emotions and a greater preference for something. Our cognitive system perceives ease of processing as an indication of familiarity and safety, resulting in more positive evaluations. This fundamental principle is vital for understanding how our first perceptual experience could change the overall evaluation of art. Artworks with symmetrical structures or those with vivid colours often enable people to process easily, hence the higher the chance to be preferred.

As Alter and Oppenheimer (2009) claims, fluency functions as a metacognitive cue, in which various judgments – perception of truth, liking, and confidence – are influenced. For example, when certain stimuli possesses the characteristics that can be easily processed, they will be regard as more familiar and credible, resulting in favourable judgments. This means whenever

we encounter visual artworks in our daily lives, the brain instantly assesses the degree of its simplicity; the initial appraisals hugely impacts the overall perception and appreciation of the artwork. For instance, an abstract artwork with clear and recurring patterns has the higher possibility to be liked since it allows our brain to process the patterns easily. This concept has been extensively examined and has significant implications.

To build on this understanding, cognitive appraisal theory entails the assessment of the intricacy, originality, and fascination of stimuli, which then impacts our emotional and aesthetic reactions. In her work, Silvia (2005) explores the significant impact of cognitive assessments on our level of involvement with visual art. According to this idea, our cognitive assessment of an artwork's characteristics—such as its intricacy, originality, and affective resonance—dictates our degree of interest and admiration.

In connection with cognitive appraisals, the Pleasure-Interest Aesthetic (PIA) Model, proposed by Graf and Landwehr (2015), combines cognitive assessments with processing fluency in order to elucidate aesthetic judgments. According to the PIA Model, our initial evaluation of the complexity and novelty of a visual stimuli affects our future emotional reaction. When the artwork is seen as intricate yet controllable, it might provoke curiosity and attention, resulting in a favourable aesthetic encounter. The correlation between cognitive judgment and emotional response is crucial in comprehending our perception and enjoyment of art. A complex sculpture that seems overpowering at first, for example, may grow increasingly attractive as we dedicate time to scrutinizing its numerous features. Initially, when we evaluate its intricacy, it may be mentally challenging. However, as we go further, our cognitive system becomes better at

handling the complexity, resulting in a feeling of accomplishment and increased admiration.

Furthermore, dual-process theories propose that our judgments are impacted by two distinct cognitive processes: automatic and deliberative. According to Ball et al. (2015), early assessments are frequently automatic and rely on perceptual fluency, resulting in rapid and effortless evaluations. However, in cases where stimuli are intricate or unclear, a more profound and intentional processing is necessary. Graf and Landwehr (2015) propose as following: the PIA Model entails an automatic process which comes first, followed by a process that is more reflective. This Dual-process perspective gives an explanation of why certain artworks are liked instantly, while there are works that necessitate more cognitive effort to be appreciated. For example, a person might like an artwork on the first sight, but with deeper reflection, he/she might come to appreciate its complexity and depth. The dual-process model is especially useful in the context of art experience, where initial automatic response can be followed by a more reflective one. Thus, the PIA Model provides a comprehensive framework in aesthetic judgments by combining both automatic and conscious cognitive mechanism.

In fact, the model elucidates precisely why many art enthusiasts often find themselves drawn to a simple yet visually appealing artwork on the first engagement but develop a deeper experience for more complicated piece subsequently. Fluency is the key in the initial automatic response, while cognitive elaboration – deeper reflection – creates more profound appreciation.

Neural correlates and cognitive mechanisms

Gaining knowledge about the brain connections associated with smoothness and interruptions can offer a more profound understanding of the mental processes that form the basis of aesthetic evaluations. Neuroimaging studies have demonstrated that specific areas of the brain are linked to the cognitive ability to process information smoothly. Specifically, regions such as the anterior cingulate cortex and the orbitofrontal cortex play a role in assessing fluency and producing good emotions (Reber et al., 2004). These specific areas of the brain have a crucial function in facilitating the connection between the ease of mental processing and the experience of aesthetic enjoyment.

Moreover, studies have shown that the default mode network (DMN), which is active during contemplative and self-reflective thinking, is activated when individuals comprehend intricate and challenging information (Graf & Landwehr, 2015). The network comprises brain regions such as the medial prefrontal cortex, posterior cingulate cortex, and angular gyrus, which are involved in self-referential thinking and cognitive elaboration. The neurological findings provide evidence for the dual-process hypothesis by showing that distinct brain regions are engaged while processing fluent stimuli automatically and when processing disfluent stimuli more consciously and reflectively.

Perceptual fluency and aesthetic responses

Studies have shown that when people find it easier to comprehend information, they tend to like it more and have favorable emotional reactions. According to a study conducted by Reber, Schwarz, and Winkielman (2004), visual stimuli that are easier to interpret have a higher likelihood of being liked. The beneficial impact of fluency arises from the decreased cognitive

exertion needed to absorb the inputs, resulting in a more enjoyable experience. According to Alter and Oppenheimer (2009), fluency improves the perceived familiarity of stimuli, leading to a positive judgment of them. This finding is similar across several fields, including visual art, where people generally choose images that are straightforward and easy to understand.

In a study examining the impact of symmetry and clarity on aesthetic evaluations, Forsythe et al. (2011) discovered that images with symmetrical and clear qualities were perceived as more beautiful than ones that were asymmetrical and unclear. These findings indicate that the quality of visual clarity and symmetry, which improve the ease of processing, have a substantial impact on our aesthetic choices. The beneficial impacts of fluency are also apparent in the fields of marketing and product design. Consumers often favor products with straightforward and unambiguous designs because they are easy to comprehend and evaluate.

The study conducted by Bar and Neta (2006) found that items with curvy features are seen more easily and smoothly whereas shape that has sharp angles pose people with more difficulty, resulting in a greater liking for the former objects. This preference for curved items has an evolutionary explanation, where smooth and curved shapes are associated with the feelings of safety and comfort, while acute angles may indicate potential danger.

Repetition is another mechanism which has a vital role in facilitating fluency. It has been shown that repeated exposure to a stimulus improves our ability to process it. The effect is referred to as the mere exposure effect, and it has been seen in multiple studies, where participants are repeatedly shown a set of photographs, which influence their preference for the image at the end.

In addition to the mechanisms of fluency, facilitating the processing of information generates a favorable emotional response, which in turn affects how beauty is seen and evaluated.

Winkielman and Cacioppo (2001) showed that when processing is made easier, it results in a favorable emotional reaction, which subsequently improves evaluations of attractiveness. The connection between fluency and pleasant emotion emphasizes the significance of the ease of processing in aesthetic appreciation.

Response to Complex stimuli

On the other hand, complex creative things can also be viewed smoothly, influencing assessments of aesthetic appeal. According to Christensen, Ball, and Reber (2013), creative products, despite their complexity, can be easily understood if they include familiar features or patterns. The fluidity of the artwork enhances its aesthetic appeal, implying that even intricate art may be admired if it is viewed as cohesive and manageable. In their study on perceptual fluency and creativity, Christensen, Ball, and Reber (2013) instructed participants to evaluate the aesthetic appeal and innovative qualities of different objects. The researchers discovered that objects that were viewed as innovative were also consistently rated as attractive, regardless of their level of complexity. This implies that the beneficial impacts of fluency encompass assessments of both aesthetic appeal and originality.

This perspective is crucial for comprehending the process of designing complex and innovative artworks to enhance their attractiveness. Artists can improve the ease of understanding and enjoyment for viewers by integrating recognizable components or patterns into intricate works.

The equilibrium between creativity and fluency is crucial in producing visually appealing artwork that deeply connects with a broad audience.

The Impact of Culture on Fluency and Aesthetic Evaluations

In addition to our biological effect, the cultural background has a substantial influence as well on how fluency and beauty are perceived. Perceptions of fluency and beauty might vary throughout different cultures. Eastern and Western cultures exhibit contrasting aesthetic standards and preferences. Eastern art frequently highlights asymmetry, simplicity, and subtlety, whereas Western art typically places importance on symmetry, complexity, and boldness (Masuda et al., 2008). Correspondingly, in a cross-cultural study conducted by Masuda and colleagues (2008), it was discovered that participants from Eastern cultures exhibited a preference for artworks that included subtle and harmonious aspects, whilst participants from Western cultures displayed a preference for artworks that had clear and distinct features. Moreover, being exposed to diverse cultural art forms can augment an individual's capacity to value a broader spectrum of artworks. Through the process of encountering and actively interacting with artistic expressions originating from diverse cultures, individuals can cultivate a more sophisticated comprehension of aesthetics and proficiency, enabling them to value and comprehend both familiar and unfamiliar artistic genres.

Disfluency and Aesthetic Responses

In contrast to fluency, complicated and unclear stimuli initially provoke unfavorable reactions because of their lack of fluency. Muth, Hesslinger, and Carbon (2015) elucidate that when visual stimuli are challenging to perceive, they might engender a feeling of unease or perplexity. The

initial negative response is a result of the heightened cognitive exertion needed to comprehend the stimulus. In their study on complexity and aesthetic assessments, Marin and Leder (2016) instructed participants to evaluate the attractiveness of intricate and uncomplicated images. It was discovered that initially, complicated images were given lower ratings in terms of beauty when compared to simple images. Nevertheless, via repeated exposure and active mental involvement, the evaluations for intricate visuals escalated, indicating that art that is first difficult to comprehend might be gradually admired. Furthermore, Belke, Leder, and Carbon (2015) proved that the act of evaluating and mentally exploring tough art multiple times might enhance one's appreciation for it. When individuals dedicate time to actively interact with contemplate art that is not easily understood, they may develop a greater understanding and admiration for its intricate nature and profoundness.

Processing fluency and positive mood have an impact on intuitive assessments of semantic coherence. According to a study by Topolinski and Strack (2009), people's instinctive judgments about the coherence of stimuli are influenced by the ease with which the information is processed. Even stimuli that are not fluent can be enjoyed if they finally become understandable and evoke a good emotional reaction. The issue of disfluency is especially pertinent in the realm of contemporary and abstract art, which frequently showcases intricate and enigmatic components. These artworks may first be challenging to comprehend, resulting in a lower initial level of appreciation. Nevertheless, as viewers spend more time and actively engage with the material, they may cultivate a more profound admiration for the intricacy and profundity of these creations.

The act of positive reappraisal is crucial in comprehending how viewers might cultivate an admiration for intricate and demanding artworks. Through the promotion of iterative assessment and cognitive involvement, artists and educators have the ability to assist viewers in transcending their initial adverse reactions and cultivating a more profound admiration for art that is challenging or difficult to comprehend.

Understanding how viewers might develop an appreciation for complex and challenging artworks relies heavily on the practice of positive reappraisal. By employing iterative assessment and engaging the cognitive faculties, artists and educators can help viewers surpass their initial negative responses and develop a deeper appreciation for art that is complex or hard to understand. Armstrong and Detweiler-Bedell (2008) propose that the successful comprehension of complex stimuli can lead to a sense of accomplishment and deep satisfaction.

The findings have significant implications for artists and educators. By providing viewers with opportunities to actively and comprehensively interact with complex artworks, they can help facilitate the process of cognitive mastery. This methodology has the ability to enhance the audience's overall visual experience and appreciation for complex artwork.

Emotional Responses to Disfluency

Individuals can have diverse emotional responses to stimuli that are not fluent. At first, work that is not smooth or fluent may cause feelings of perplexity, annoyance, or even disgust since it requires more mental effort to understand. Nevertheless, these adverse emotions have the potential to evolve into favorable sentiments of contentment and admiration when viewers delve

more profoundly into the artwork. For example, complex and ambiguous art frequently generates curiosity and excitement, compelling viewers to delve further into the artwork. Engaging in this exploration can result in moments of epiphany and comprehension, which are accompanied by good emotions such as contentment and gratification (Muth et al., 2015). Furthermore, the emotional process of understanding and valuing art that is intentionally not smooth can heighten the overall visual encounter. The first obstacle and subsequent gratification enhance the memorability and significance of the connection with the artwork. Emotional engagement has a vital role in cultivating a more profound connection with intricate and demanding creative genres.

The Role of individual differences

Personality factors and cognitive styles can have a substantial impact on how individuals respond to work that is not fluent. Certain individuals may exhibit a higher propensity for embracing novel experiences and displaying a greater inclination towards engaging with intricate and demanding art works. For instance, individuals that possess a high degree of openness to experience, which is a personality attribute characterized by a readiness to explore new ideas and engage with unfamiliar stimuli, are more likely to have an inclination towards appreciating art that is disfluent (McCrae & Costa, 1997). These folks are likely to find the intellectual stimulation of work that is intentionally made difficult to understand to be engaging and pleasurable.

On the other hand, people who have lesser levels of openness or a penchant for simplicity and clarity may see disfluent art as more difficult and less pleasurable. Comprehending these unique

variations is crucial for customizing art teaching and enjoyment tactics for varied audiences.

Interaction between fluency and disfluency in aesthetic judgments

The concept of dual preference formation processes elucidates how artworks, whether fluent or disfluent, can be appreciated through distinct cognitive mechanisms. Belke, Leder, and Carbon (2015) propose that, although fluency can result in immediate love, artworks that are disfluent necessitate a more profound cognitive involvement in order to be appreciated. The Pleasure-Interest Aesthetic (PIA) Model endorses the idea of a dual-process approach, in which there is an initial phase of instinctive processing that is subsequently followed by more thoughtful cognitive processes.

The PIA Model encompasses both an early, automated procedure and a subsequent, introspective phase. Graf and Landwehr (2015) argue that the dual-process model provides an explanation for why certain artworks are immediately appealing, while others necessitate more cognitive involvement. The PIA Model offers a complete framework for understanding aesthetic judgments by integrating both automatic and conscious cognitive mechanisms.

In their study on dual-process models, Graf and Landwehr (2015) discovered that participants' initial preference for artworks was affected by fluency, whereas their later assessments were impacted by cognitive involvement and elaboration. This indicates that both unconscious and intentional processes contribute to the formation of our aesthetic preferences.

The process of dual preference creation is especially applicable in the realm of art appreciation,

where early spontaneous reactions can be succeeded by more thoughtful assessments. According to Belke et al. (2015), viewers who continually analyze and engage with disfluent art are more inclined to recognize its richness and depth. Repeated exposure to a stimulus enables cognitive elaboration, which can convert early difficulty into a favorable aesthetic encounter.

The continuous evaluation of artworks significantly influences viewers' capacity to cultivate an appreciation for intricate and challenging compositions. By encouraging iterative assessment and cognitive engagement, artists and educators can help viewers go beyond their initial negative reactions, resulting in the development of a deeper appreciation for art that challenges conventional understandability.

Assessments of aesthetic quality are influenced by both the affective and cognitive parts working together. Within the realm of aesthetic responses, Hagtvedt et al. (2008) argue that both emotional and intellectual processes play a significant part in the formation of our responses. Cognitive evaluations, such as appraisals of complexity and novelty, interact with affective responses, which are emotional reactions to fluency. Affective responses are a type of emotional reaction.

The combination of cognitive and affective processes is necessary for the appreciation of aesthetics. According to Jacobsen and Hofel (2002), our aesthetic judgments are influenced by the interplay between our emotional responses and our cognitive evaluations. During this interaction, it became evident that one must consider both the cognitive and affective aspects of art in order to understand and value it. Understanding the process of forming aesthetic

evaluations requires the interaction of emotional and intellectual factors. By considering both variables, we can get a more comprehensive understanding of how humans interact with and respond to visual stimuli. This practice can aid artists and educators in creating artworks that are more compelling and influential.

Cognitive dissonance arises when an individual's preconceived expectations conflict with their actual experience. For example, an individual may suffer cognitive dissonance when they are first presented with an abstract visual that appears chaotic and is challenging to understand. The discrepancy between the two sources creates a feeling of discomfort and perplexity in the individual. This discrepancy becomes most apparent when examining artwork that is highly detailed and challenges the boundaries of our cognitive capacities. However, the viewer might potentially resolve this conflicting psychological state by doing a comprehensive analysis of the various elements of the artwork and actively striving to recognize the significance of the artwork.

Interacting with and analyzing complex artwork, referred to as disfluent art, aids in resolving cognitive dissonance and emphasizes the need of mental exertion in understanding and appreciating it. Artists and educators has the capacity to confront issues and enrich the aesthetic experience by actively promoting viewers to engage with thought-provoking artworks.

Implications for Art appreciation and Education

Understanding the cognitive processes involved in appreciating art can provide valuable information for educational methods and improve the overall experience of seeing art.

Chatterjee (2014) suggests that educators might encourage a deeper engagement with art by understanding how cognitive and affective processes influence aesthetic judgments and implementing suitable strategies. For example, educators possess the capacity to inspire students to reflect on their first reactions and engage in cognitive elaboration to enhance their comprehension of complex artworks. Educators can also enhance their engagement with art by utilizing their understanding of cognitive appraisals. In her 2005 research, Silvia elucidates that teachers can foster a deeper and more engaged approach to art appreciation by helping students understand how their cognitive judgments influence their emotional responses.

Design and marketing

Utilizing the concept of fluency and efficiently reducing any disturbances in the user experience are two ways in which designers can improve the appearance of a product. It has been suggested by Alter and Oppenheimer (2009) that having an awareness of the influence that fluency has on aesthetic judgments could be of assistance to designers in the process of creating visually appealing goods. It is possible for designers to increase the likelihood that their products will receive positive ratings by integrating characteristics that improve processing fluency. Some examples of these characteristics are symmetry and clarity.

Effective disfluency management may also have other benefits. Introducing difficult or puzzling elements can fascinate viewers and inspire deep thinking. This will improve design comprehension and appreciation. Designers may combine fluidity and disruption to create visually and cognitively compelling works.

The practical implications of these discoveries transcend art and design and have relevance in diverse domains such as marketing, education, and user experience design. Professionals in these industries can enhance the effectiveness and appeal of their designs by comprehending the cognitive mechanisms that underlie aesthetic judgments.

Fostering Appreciation for Disfluent Art

Art educators have a vital role in fostering an appreciation for disfluent work among students and viewers. Through the provision of guidance and resources, educators can assist viewers in navigating intricate and demanding artworks, enabling them to transcend their initial unfavorable reactions and cultivate a more profound comprehension and admiration. Debates and reflective activities in art education work well. Teachers can encourage students to study and evaluate difficult artworks and help them think deeply. By creating a friendly and inclusive environment, educators can help students engage with and understand complex art. Additionally, viewers can better appreciate fluency and disfluency by viewing many artworks.

Art therapy's implications

This research also affects art therapy. Art therapy often utilizes artistic talents to help clients express and understand their feelings. Knowing the cognitive mechanisms that cause fluency and disfluency can improve art therapy. Therapists may use fluency-boosting methods to help clients feel more calm and hopeful during art sessions. Symmetry and repetition help psychotherapists create a supportive and enjoyable atmosphere for their clients.

In contrary, therapists can also influence clients' cognitive engagement and inspiration with non-fluent art-making. Therapy can increase clients' problem-solving and emotional resilience by encouraging them to participate in tough and unpredictable art projects.

Conclusion

The significance of processing fluency in aesthetic judgments emphasizes the crucial role of the ease of processing in influencing preferences. Reber, Schwarz, and Winkielman (2004) provide evidence that when something is easy to process, it leads to favorable emotions and a greater preference for it, emphasizing the importance of how easily we process information in our aesthetic experiences.

Dual process theories explain aesthetic preferences comprehensively. According to Graf and Landwehr (2015), unconscious and purposeful cognitive processes combine to form aesthetic judgments. A dual-process approach explains why some artworks are quickly valued while others require more cognitive effort to understand.

This thesis emphasizes the importance of disfluency and fluency in aesthetic evaluations. Distinctive works take more cognitive effort to understand, while fluid works are immediately appealing. This dual-process paradigm provides a good foundation for understanding human aesthetic preferences.

Future Research

Further investigation is needed to examine the brain processes that are involved in making intuitive judgments based on fluency. According to Topolinski and Strack (2009), studying the brain activity associated with how easily or difficultly information is processed will facilitate our understanding of mental and emotional processes involved in making aesthetic judgments.

Furthermore it is essential to determine how cognitive styles and personality variables affect responses to polished and unrefined art. Additionally, it is needed to investigate the long-term effects of repeated exposure to work that lacks smoothness, as well as how ongoing cognitive engagement influences aesthetic preferences. This study can provide important insights on the process of developing a deeper understanding and appreciation for sophisticated and challenging artworks.

Final thoughts

To fully comprehend aesthetic perceptions, cognitive and emotional processes must be integrated. Chatterjee (2014) conducted a study that gives insight on how our emotional reactions and cognitive assessments influence our understanding and interpretation of art. By taking into account both variables, we can cultivate a more all-encompassing comprehension of our interactions with and reactions to visual inputs.

This thesis highlights the cognitive mechanisms that affect how we perceive and react to mediocre visual art. Understanding how conscious and autonomic cognitive processes affect aesthetic judgments can help us enjoy complex and difficult art.

This study affects design, marketing, and education beyond art appreciation. Understanding aesthetic evaluation cognitive processes can help practitioners produce designs that are captivating, impactful, and relatable to a wide range of people. Understanding on cognitive processes can improve one's awareness and enjoyment of artworks, regardless of aesthetic worth.

References

- Alter, A. L., & Oppenheimer, D. M. (2009). Uniting the Tribes of Fluency to Form a Metacognitive Nation. *Personality and Social Psychology Review*, *13*(3), 219–235.
<https://doi.org/10.1177/1088868309341564>
- Armstrong, T., & Detweiler-Bedell, B. (2008). Beauty as an Emotion: The Exhilarating Prospect of Mastering a Challenging World. *Review of General Psychology*, *12*(4), 305–329.
<https://doi.org/10.1037/a0012558>
- Ball, L. J., Threadgold, E., Marsh, J. E., & Christensen, B. T. (2018). The effects of stimulus complexity and conceptual fluency on aesthetic judgments of abstract art: Evidence for a default–interventionist account. *Metaphor and Symbol*, *33*(3), 235–252.
<https://doi.org/10.1080/10926488.2018.1481255>
- Bar, M., & Neta, M. (2006). Humans Prefer Curved Visual Objects. *Psychological Science*, *17*(8), 645–648. <https://doi.org/10.1111/j.1467-9280.2006.01759.x>
- Belke, B., Leder, H., & Carbon, C. C. (2015). When Challenging Art Gets Liked: Evidences for a Dual Preference Formation Process for Fluent and Non-Fluent Portraits. *PLOS ONE*, *10*(8), e0131796.
<https://doi.org/10.1371/journal.pone.0131796>
- Christensen, B. T., Ball, L. J., & Reber, R. (2019). Perceptual fluency effects in judgments of creativity and beauty: creative objects are perceived fluently yet they are visually complex. *Journal of Cognitive Psychology*, *32*(1), 45–66. <https://doi.org/10.1080/20445911.2019.1689986>
- Forsythe, A., Nadal, M., Sheehy, N., Cela-Conde, C. J., & Sawey, M. (2011). Predicting beauty: Fractal dimension and visual complexity in art. *British Journal of Psychology*, *102*(1), 49–70.
<https://doi.org/10.1348/000712610x498958>

- Graf, L. K. M., & Landwehr, J. R. (2015). A Dual-Process Perspective on Fluency-Based Aesthetics. *Personality and Social Psychology Review, 19*(4), 395–410.
<https://doi.org/10.1177/1088868315574978>
- Hagtvedt, H., Patrick, V. M., & Hagtvedt, R. (2008). The Perception and Evaluation of Visual Art. *Empirical Studies of the Arts, 26*(2), 197–218. <https://doi.org/10.2190/em.26.2.d>
- Jacobsen, T., & Höfel, L. (2002). Aesthetic Judgments of Novel Graphic Patterns: Analyses of Individual Judgments. *Perceptual and Motor Skills, 95*(3), 755–766.
<https://doi.org/10.2466/pms.2002.95.3.755>
- Marin, M. M., & Leder, H. (2013). Examining Complexity across Domains: Relating Subjective and Objective Measures of Affective Environmental Scenes, Paintings and Music. *PLoS ONE, 8*(8), e72412. <https://doi.org/10.1371/journal.pone.0072412>
- Md Anjan Chatterjee. (2013). *The Aesthetic Brain : How We Evolved to Desire Beauty and Enjoy Art*. New York Oxford University Press -11-22.
- Muth, C., Hesslinger, V. M., & Carbon, C.-C. (2015). The appeal of challenge in the perception of art: How ambiguity, solvability of ambiguity, and the opportunity for insight affect appreciation. *Psychology of Aesthetics, Creativity, and the Arts, 9*(3), 206–216.
<https://doi.org/10.1037/a0038814>
- PAUL J. SILVIA. (2005). COGNITIVE APPRAISALS AND INTEREST IN VISUAL ART: EXPLORING AN APPRAISAL THEORY OF AESTHETIC EMOTIONS. *Empirical Studies of the Arts, 23*(2), 119–133. <https://doi.org/10.2190/12av-ah2p-mceh-289e>
- Reber, R., Schwarz, N., & Winkielman, P. (2004). Processing Fluency and Aesthetic Pleasure: Is Beauty in the Perceiver's Processing Experience? *Personality and Social Psychology Review, 8*(4), 364–382. https://doi.org/10.1207/s15327957pspr0804_3

- Reber, R., Winkielman, P., & Schwarz, N. (1998). Effects of Perceptual Fluency on Affective Judgments. *Psychological Science*, *9*(1), 45–48. <https://doi.org/10.1111/1467-9280.00008>
- Silva, R. R., Garcia-Marques, T., & Mello, J. (2015). The differential effects of fluency due to repetition and fluency due to color contrast on judgments of truth. *Psychological Research*, *80*(5), 821–837. <https://doi.org/10.1007/s00426-015-0692-7>
- Topolinski, S., & Strack, F. (2009). The analysis of intuition: Processing fluency and affect in judgements of semantic coherence. *Cognition & Emotion*, *23*(8), 1465–1503. <https://doi.org/10.1080/02699930802420745>
- Winkielman, P., & Cacioppo, J. T. (2001). Mind at ease puts a smile on the face: Psychophysiological evidence that processing facilitation elicits positive affect. *Journal of Personality and Social Psychology*, *81*(6), 989–1000. <https://doi.org/10.1037/0022-3514.81.6.989>
- Winkielman, P., Schwarz, N., & Reber, R. (2003). *The hedonic marking of processing fluency: Implications for evaluative judgment.*