Original Article
ISSN (Online): 2350-0530
ISSN (Print): 2394-3629

International Journal of Research - GRANTHAALAYAH
April 2021 9(4), 343–352

THE NEUROAESTHETICS OF FASHION DESIGN

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ABSTRACT

Close your eyes and imagine that you are in an art museum. You look over your right shoulder and see a painting of a lush garden landscape. Try to investigate it further. Observe the abundance of pastel-colored flowers, engaging vantage points and mystical partially hidden pathways.[a] Then, consider how the landscape makes you feel. Now, keep your eyes closed and imagine another scenario. You are sitting in the front row of Christian Dior's "The Garden of Earthly Delights" fashion show.[b] Try to concentrate on the clothing. Observe the plethora of delicate, soft-hued, floral-print gowns. Finally, consider how the fashions make you feel.

[a] Anjan Chatterjee, The Aesthetic Brain, (New York, Oxford University Press, 2014), 53.
[b] "Dior – The Garden of Earthly Delights Show," Marie Claire, April 15, 2020, July 9, 2015, https://www.marieclaire.co.uk/news/fashion-news/dior-the-garden-of-earthly-delights-64160

Received 2 April 2021
Accepted 18 April 2021
Published 30 April 2021

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DOI 10.29121/granthaalayah.v9.i4.2021.3869

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Keywords: Museum, Pastel-Colored, Fashion Show, Soft-Hued, Floral-Print Gowns

1. INTRODUCTION

Was it pleasurable to experience either the landscape or the fashions? Did one make you feel good or calm? Did both? Did you find them aesthetically pleasing? Would you attribute "beauty" to either or both of them?

From an evolutionary biological standpoint, it seems that all humans find beauty in or are aesthetically pleased by the physical presence of garden landscapes.[1] However, what about when they are presented in the form of paintings or fashions? Do humans still find them pleasurable? This question will not be explored in this paper; however, it is an important starting point for the questions that will be. Furthermore, this paper investigates humans' universal biological correlates to beauty. Then, it explains how these correlates manifest themselves in attractive paintings and fashions. Lastly, it tests this idea of evolutionarily engrained beauty by considering fashions that abide by and defy these principles.

[1] Anjan Chatterjee, The Aesthetic Brain, (New York, Oxford University Press, 2014), 53.

2. THE EVOLUTION OF BEAUTY

An aesthetic experience occurs when humans' sensory, emotional and cognitive biomechanisms activate in response to perceived, felt or sensed beauty.[2] Given that humans attribute beauty to many types of stimuli, one might think that there are some base-line traits that all beautiful stimuli contain. These traits can be discovered through investigation of beauty's evolutionary roots.

Based on Darwin's theory of evolution, humans' idea of beauty is shaped by two forces: natural and sexual selection.[3] Natural selection can be defined as "a force that selects resilient characteristics, both physical and mental, by passively eliminating traits that are less effective than others for survival."[4] An example of how natural selection has shaped human perception of beauty is illustrated by Balling and Falk's study "Development of Visual Preferences for Natural Environments." The study investigated human preferences for certain landscapes.[5] Experimenters showed participants (ages 8-70) images of different natural landscapes: tropical forests, deciduous forests, coniferous forests, deserts and the East African savannas. Then, participants were asked to select the environment that they would like to live in or visit the most. Participants under the age of fifteen consistently selected the East African savanna. These participants had never traveled to Africa. This suggests that humans are born with a programed preference for savannas. This is called the "savanna hypothesis."[6]

Natural selection explains the "savanna hypothesis" because, from an evolutionary standpoint, savannas were an excellent place to live. They had large acacia trees which provided shelter and protection from the strong African sun and they had an abundance of animals which could be used for protein. Therefore, humans evolved to find savannas beautiful because they were an effective environment for survival.[7]

Similar to natural selection, sexual selection shaped human perception of beauty as well. Sexual selection is the idea that humans retain traits that enhance their chances of reproduction.[8] In other words, they retain traits that the opposite sex finds beautiful in order to attract them and eventually reproduce. This idea is illustrated by the features that heterosexual men are attracted to in women. For instance, men are attracted to women with narrow waists, large breast and wide hips.[9] Whether men are conscious of this or not, all of these features are linked to strong female fertility. Thus, sexual selection shapes beauty because men are attracted to and, thus, find women beautiful who increase their likelihood of

[2] Nami, M.T. & Ashayeri, H. (2010). Where Neuroscience and Art Embrace; The Neuroaesthetics. Basic and Clinical Neuroscience, 2.

[3] Anjan Chatterjee, The Aesthetic Brain, (New York, Oxford University Press, 2014), 39.

[4] Ibid, 45.

[5] Balling, J.D., & Falk, J.H. (1982). Development of visual preferences for natural environments. Environment and Behavior, 5-28.

[6] Anjan Chatterjee, The Aesthetic Brain, (New York, Oxford University Press, 2014), 49.

[7] Ibid.

[8] Ibid, 38.

[9] Ibid, 21.

producing healthy children.[10]

3. THE BIOLOGICAL BASIS OF ATTRACTIVENESS

As discussed above, attraction heavily influences what people find beautiful. Therefore, in order to fully understand beauty, it is necessary to also examine attractiveness. Scholar Anjan Chatterjee believes that there are three main parameters that contribute to universal attractiveness: averageness, symmetry and the exaggeration of sexually dimorphic features.[11]

The first parameter of universal attractiveness, meaning the perception that something is attractive to all human cultures, is averageness. This can be explained using natural selection. For example, evolution has demonstrated that if a stimulus is average, it has a higher likelihood of survival.[12] This is supported by research studies which suggest that humans have a preference for mixed race over in-bred people. This makes sense because mixed race people show signs of genetic diversity, which contributes to greater flexibility to adapt and survive under varied conditions.[13] In addition, averageness is a sign of health and fitness. Therefore, if one were to choose a mate with averaged features, they would have a strong chance at producing healthy children.[14]

Symmetry is another universally attractive feature. It is mainly explained by the force of natural selection. Symmetry is a fitness indicator because it implies that the person has a healthy nervous and immune system.[15] This is because, at a subconscious level, people link asymmetries to the after-effects of parasites. In addition, some scholars suggest that asymmetrical bodies are less efficient at moving towards goals, avoiding danger and living long lives. For example, when the skeletal remains of prehistoric Native Americans were carbon dated, they found that those who had symmetrical bones lived longer than those that were asymmetrical.[16] Therefore, people seem to be attracted to symmetrical mates in order to enhance their future offspring's chances of survival.

The last parameter of universal attractiveness is sexually dimorphic features. Sexually dimorphic features are those that emphasize the differences between sexes.[17] They are produced by the sex hormones estrogen (makes features more feminine) and testosterone (makes features more masculine). As was previously discussed, males are particularly attracted to female features that signal fertility or show the physical effects of estrogen.[18] For instance, they prefer women with high foreheads,

[10] Ibid, 39.
[11] Ibid.
[12] Ibid, 40.
[13] Ibid.
[14] Ibid.
[15] Ibid.
[16] Ibid, 41.
[17] Ibid, 13.
[18] Ibid.

small noses, big eyes, full lips and small chins, all features that are linked to high levels of estrogen.

Conversely, heterosexual women seem to be attracted to features that are associated with testosterone such as squared-off jaws, thin cheeks and heavy brows. However, it is important to note that females tend to value physical attractiveness significantly less than their male counterparts. Rather, when searching for a mate, they are attracted to men with status, power, wealth and ability to protect and provide.[19]

Overall, humanity's conception of attractiveness is rooted in themes of survival and reproduction. Heterosexual individuals find humans of the opposite sex particularly attractive if they appear to be physically average, symmetric and/or sexually dimorphic. Given that all of these traits are visual representations of evolutionary fitness, it seems that physical attractiveness acts as an outward manifestation of strong internal makeup. However, one might ask the question, how is it that humans were able to determine this correlation? The answer lies in the cognitive reward that human brains' neural mechanisms grant to attractiveness, beauty and pleasure.

4. THE NEURAL MECHANISMS THAT UNDERLIE ATTRACTIVENESS, BEAUTY AND PLEASURE

In order to understand why humans, behave in line with these evolutionarily determined standards of attractiveness, one must understand the basic neural mechanisms that underlie it and how they impact the cognitive function of the human brain. fMRI studies by Kawabata & Zeki (2004), Di Dio & Associates (2007), Ticini et al (2014) provide excellent frameworks for this investigation.[20] This is because they show that the anatomical structures which are activated by attractive, beautiful and/or pleasurable stimuli tend to induce feelings of cognitive reward in the human brain.[21] These structures are discussed below and the majority of them are involved in object recognition, emotion and reward.

Firstly, the main structures that are involved in object recognition are Area V1, fusiform face area (FFA) and the parahippocampal gyrus (PPA). V1 is the primary visual cortex. It is located in the back of the occipital lobe and it is responsible for processing visual information. Next, the FFA is located in the ventral stream of the temporal lobe and it is important for recognizing faces. Lastly, the PPA plays an important role in the recognition of environmental scenes. It is what would have been activated during the hypothetical garden viewing experience. It is located in the middle of the temporo-occipital cortex. These areas are important because they provide the input for the emotional centers of the brain

Secondly, the main structures involved in emotional functions are the amygdala, insula, orbitofrontal cortex (OFC) and ventral medial prefrontal cortex (vmPFC). The

[19] Ibid, 14.

[20] Nami, M.T. & Ashayeri, H. (2010). Where Neuroscience and Art Embrace; The Neuroaesthetics. Basic and Clinical Neuroscience, 4.

[21] Ibid.

amygdala is located in the frontal portion of the brain's temporal lobe. It is important for early detection of and rapid response to emotional information.[22] Similarly, the insula activates when someone experiences emotion and positive sensations.[23] It is located in the lateral sulcus, just dorsal (above) to the amygdala. The OFC and vmPFC are both located in the prefrontal cortex, just above the eye sockets. They too are activated when someone experiences emotion. Once these emotional structures are activated, they go on to stimulate the brain's reward-based structures.

Third, the structures that are involved in reward functions are the nucleus accumbens, OFC and vmPFC. The nucleus accumbens is located in the basal forebrain. It is analyzes and processes reward and gives the brain a sense of pleasure and desire. Lastly, the OFC and vmPFC, discussed above, help mediate reward through their connection to the nucleus accumbens.[24]

The fact that these structures either indirectly (object recognition structures) or directly (reward structures) generate feelings of cognitive reward suggests that humans behave in line with evolutionarily determined standards of attractiveness because when they look at attractive people, they are biologically programed to activate neural structures that induce feelings of pleasure. This cascading neural activation network is a biological reinforcer that it is in one's favor to be attracted to people with certain evolutionarily desirable traits.

This idea is supported by University of Oslo researcher, Olga Chelnokova, PhD. [25] In her study of how evolutionary preferences for attractiveness manifest themselves in the human brain, she concluded that when participants were presented with photos of faces of varied levels of physical attractiveness, their V1s tended to activate proportionally to how attractive they found the face.[26] Given that V1 provides input to the insula and, in turn, the insula provides input to the OFC, which mediates cognitive reward, it seems that the more attractive the stimulus, the more cognitive reward the participants receives from looking at it.

Thus, it is appropriate to conclude that humans have biological reasons for preferring attractive people. However, similar to how the discussion of attractive garden stimuli prompted questions regarding form, it is important to investigate if humans retain a preference for attractive traits, such as averageness, symmetrically and sexually dimorphism, even when they are manifested in non-human forms. This prompts the discussion of how evolutionary beauty can manifest itself in other aesthetic forms such as painting or fashion.

[22] Marie T. Banich and Rebecca J. Compton, Cognitive Neuroscience, (Cambridge, Cambridge University Press, 2018), 371.
[23] Ibid, 376.
[24] Ibid, 378.
[25] "Why We Look at Pretty Faces," Science Daily, April 25, 2020, November 10, 2015, https://www.sciencedaily.com/releases/2015/11/151110102344.htm
[26] Anjan Chatterjee, The Aesthetic Brain, (New York, Oxford University Press, 2014), 39.

5. THE STUDY OF NEUROAESTHETICS

The main evidence that humans are universally attracted to certain traits is that they experience similar activation of object recognition, emotion and/or reward-based neural mechanisms when viewing either attractive people or pleasurable art. For instance, similar to Olga Chelnokova's findings about the neural correlates underlying human preference for attractive mates, research has shown that aesthetic preferences are heavily mediated by emotion centers in the brain, such as the insula and amygdala.[27] This suggests that humans also have overt neural counterparts for pleasurable aesthetic experiences. This is the primary idea studied in Neuroaesthetics.

Neuroscientist Semis Zeki, who coined the term "Neuroaesthetics," defined it as "an investigation of the neurological mechanisms that underlie art."[28] Thus, Neuroaesthetics can be used to effectively explain why humans find certain stimuli aesthetically pleasing. For instance, consider Marcel Duchamp's cubist painting Portrait of Chess Players (1913) [Figure 1]. [29] Researchers have determined that even though this painting is seemingly in-average, non-symmetric and non-sexually dimorphic, viewers still find it particularly pleasing. Neuroscientist V.S. Ramachandran uses Neuroaesthetics to explain this idea.

Figure 1 Marcel Duchamp, Portrait of Chess Players,1913.Oil on canvas, 100.6x100.5 centimeters

Foremost, he notes the importance of simultaneously present views of faces from different vantage points that are visible in the painting. Next, he explains why they triggers a pleasurable reaction by describing the neurological mechanisms that underlie them. Specifically, he describes that the FFA has two main types of cells: 1. Cells that respond to certain views of faces, 2. Cells that respond to all views of faces ("master face cells"). He goes on to explain that when people look at someone's face,

[27] Nami, M.T. & Ashayeri, H. (2010). Where Neuroscience and Art Embrace; The Neuroaesthetics. Basic and Clinical Neuroscience, 5.
[28] Huang, M. (2009). The Neuroscience of Art. Stanford Journal of Neuroscience, 25.
[29] Ibid.

they are only able to see one view of it at a time. Thus, they are unable to activate their "all view" face cells. However, when they look at Portrait of Chess Players (1913), they are able to see numerous facial views at a time. This enables the firing of multiple "single view" cells, which in turn, hyperactivate the "master face cells." These cells go on to excite the limbic system (emotion), thereby, causing the viewer to experience pleasurable emotions.[30] This proves that if an aesthetic object, such as a painting, has certain characteristics, humans can receive emotional reward or pleasure from it.

6. THE NEUROAESTHETICS OF FASHION DESIGN

Paintings have always been treated as "aesthetic objects," however, it was not until the 1980s that fashion designs began to be considered as such.[31] In 1985, behavioral scientist George B. Sproles supported fashion's new classification by stating that, "The approaches of the aesthetician were easily overlooked when analyzing fashion [...] This was a serious oversight, for fashions are aesthetic products."[32] Given that fashion designs are "aesthetic objects," similar to attractive humans and pleasurable paintings, the evolutionary basis of attractive clothing can also be investigated. Thus, the final part of this paper focuses on the clothing of two fashion brands: Versace and Gucci.[33] While they are both in the top 10 of e-commerce company Lyst's "August 2019- Hottest Brands in the World," they attract consumers for very different reasons.

From Versace's signature plunging necklines to their thigh-high skirt slits, since their creation in 1978, they have been a universal symbol of sex, luxury and glamour.[34] Thus, they attract consumers by abiding by the universal correlates of beauty discussed above. This is demonstrated by the outfits that they designed for Jennifer Lopez's Super Bowl LIV Half-Time Show performance, specifically, her nude-illusion bodysuit [Figure 2].[35] While it did not appear to be "average," it definitely had symmetric and sexually dimorphic features. For instance, Atelier Versace's master embroiderers strategically embossed the suit with a symmetrical mosaic pattern consisting of Swarovski crystals, micro-materials, metallic leather inserts and

[30] Ibid.

[31] Kim, S.B. (1998). Is Fashion Art? Fashion Theory, 52.

[32] Ibid.

[33] "The Lyst Index: Fashion's Hottest brands and Products Q2 2019," Lyst Insights, April 25, 2020, https://www.lyst.com/data/the-lyst-index/q219/

[34] "Versace News, Collections, Fashion Shows, Fashion Weeks Reviews, and More," Vogue, April 26, 2020, September 20, 2019, https://www.vogue.com/fashion-shows/designer/versace

[35] Okwodu, Janelle. "The Story Behind Jennifer Lopez's Epic Versace Super Bowl Wardrobe," Vogue, April 26, 2020, February 3, 2020, https://www.vogue.com/vogueworld/article/jennifer-lopez-superbowl-2020-versace-wardrobe-rob-and-mariel-interview

Figure 2 Jennifer Lopez, Super Bowl LIV, Feb. 3, 2020, Versace

lustrous plastic elements.[36] In addition, the bodysuit emphasized her feminine features. The deep V-neckline drew attention to her breasts and the way that the mosaic pattern tightly cut in at her waist and then extended out made her waist look narrow and hips look wide.[37] Given that this bodysuit is the epitome of the Versace design aesthetic, it shows that the brand heavily abides by evolutionary standards of beauty. However, the same cannot be said for Gucci.

Under the guidance of Creative Director Alessendro Michele, Gucci has decided to defy evolutionary ideals of beauty like sexual dimorphism, in exchange for attracting consumers with androgynous designs.[38] Michele has explained these designs by stating that "there are a lot of really beautiful girls that can look like a man and also men [that] look like a woman."[39] The look that singer Billie Eilish wore to the 2020 Grammy Awards displays Michele's design aesthetic well [Figure 3]. Unlike Lopez's feminine, body hugging look, Eilish's outfit was androgynous and oversized. Specifically, she wore a cream-colored long sleeve shirt and pants. The stiffness of the fabric and looseness of the

[36] Corpuz, Kristin. "Jennifer Lopez's Super Bowl 2020 Halftime Fashion," Billboard, April 26, 2020, February 3, 2020, https://www.billboard.com/articles/news/super-bowl/8549927/jennifer-lopez-super-bowl-2020-halftime-costume-details

[37] Anjan Chatterjee, The Aesthetic Brain, (New York, Oxford University Press, 2014), 21.

[38] "Gucci Celebrates Androgynous Fashion," Fashion Industry Broadcast, April 26, 2020, July 16, 2015, https://fashionindustrybroadcast.com/2015/06/25/gucci-celebrates-androgynous-fashion/

[39] Ibid.

Figure 3 Billie Eilish, 2020 Grammy Awards, Jan. 26, 2020, Gucci

pattern gave her a boxy and unrevealing silhouette.[40] In fact, Eilish told Teen Vogue the goal of the outfit was for it to "not reveal what's [the shape of her body] underneath."[41] Given that sexually dimorphic features are those that emphasize the differences between sexes, Gucci's androgynous designs prove that sexually dimorphic features are not universally needed for attractive clothing.

The study of Neuroaesthetics explains that biological correlates of pleasure underly human attraction. This begs the questions: what are humans attracted to? Chatterjee suggests average, symmetric and sexually dimorphic features. While this is correct when applied to forms such as humans and landscapes, it not completely correct when applied to forms such as painting or fashion. This is demonstrated by consumers attraction to both Versace and Gucci, even though Gucci defies Chatterjee's universal parameters of attractiveness. This is particularly relevant because, as online consumer insight company Hitwise reports, the majority of both Versace and Gucci's consumer-bases are millennials ages 24 to 34.[42] This suggests that Chatterjee's universal parameters are not actually universal. Rather, it seems that his principles are applicable to some forms and some age-groups but not others. Thus, even though research has yet to be done on this specific topic, it seems highly probable that there are other factors, besides evolutionary standards, that attract

[40] Celletti, Erin. « Billie Eilish Is Dripping in Head-to-Toe Gucci at the Grammys 2020," Teen Vogue, April 26, 2020, January 27, 2020, https://www.teenvogue.com/story/billie-eilish-grammys-2020-red-carpet

[41] Ibid.

[42] "Luxury Millennial Shoppers- Trends & Insights to Reach Luxury Millennial Consumers," Hitwise, May 7, 2020, February 18, 2017, http://hitwise.connexity.com/rs/371-PLE-119/images/Luxury_Report_US-Final.pdf

humans, especially millennials, to certain clothing. It is even possible that fashion design is a medium in which beauty is evoked through the deliberate violation of evolutionary standards of attractiveness. After all, as Neuroaesthetics discovered from Duchamp's Portrait of Chess Players (1913), humanity is constantly evolving, adjusting and finding beauty in non "evolutionarily attractive" art forms.

Banich and Compton (2018); Celletti et al. (2020); Chatterjee (2015); Corpuz (2020); "Gucci Celebrates Androgynous Fashion" (2015); Huang (2009); Kim and Bok (1998); *Luxury Millennial Shoppers- Trends & Insights To Reach Luxury Millennial Consumers* (2017); *The Lyst Index: Fashion's Hottest Brands And Products Q2 2019* (2019); Nami et al. (2011); News and Vogue, 20 Sept. 2019 (2019); Okwodu (2020); *Why We Look At Pretty Faces* (2015)

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