Holistic Representation of Facial Attractiveness and Its Dynamic Enhancement

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Abstract

Facial attractiveness plays a significant role in critical social decisions (e.g., mate selection, job seeking, social exchange). Previous research on facial attractiveness has primarily focused on explaining the influence of various static facial features from an evolutionary perspective, with less emphasis on the cognitive representation of static facial attractiveness. In recent years, research on dynamic facial attractiveness has emerged as a burgeoning frontier, revealing that dynamic information can enhance facial attractiveness, though the underlying mechanisms remain unclear. The present study will employ behavioral experiments combined with eye-tracking and structural equation modeling techniques to investigate the holistic representation of facial attractiveness, and will examine the mechanisms underlying the dynamic enhancement of facial attractiveness from the perspectives of holistic processing, attention, and vitality. This research will deepen our understanding of facial attractiveness and the higher-order intelligence underlying human aesthetic appreciation. Moreover, the findings of this study hold potential applications in daily interpersonal interactions and artificial intelligence.

Full Text

The Holistic Representation of Facial Attractiveness and Its Enhancement Through Dynamic Cues

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Abstract

Facial attractiveness plays a crucial role in important social decisions such as mate selection, job seeking, and social exchange. Previous research on facial

attractiveness has predominantly adopted an evolutionary perspective to explain how various static facial features influence attractiveness, while paying relatively little attention to the cognitive representation of facial attractiveness itself. In recent years, investigating dynamic facial attractiveness has emerged as a cutting-edge research area, with studies finding that motion can enhance facial attractiveness, though the underlying mechanism remains unclear. The present research will employ behavioral experiments combined with eye-tracking technology and structural equation modeling to explore the holistic representation of facial attractiveness and examine how dynamic cues enhance attractiveness through holistic processing, attentional mechanisms, and vitality perception. This research will deepen our understanding of facial attractiveness and the high-level intelligence underlying human aesthetic appreciation, with potential applications in daily interpersonal interactions and artificial intelligence.

Keywords: cognitive aesthetics, aesthetic perception, facial attractiveness, attention, holistic processing

1. Current Research Status

The proverb "beauty is in the eye of the beholder" reflects how our lives are filled with aesthetic perception and experience, with many daily decisions based on aesthetic preferences. We choose particular clothing, music, food, or even romantic partners because these options hold greater appeal and bring us pleasure, involving aesthetic perception and evaluation across visual, auditory, gustatory, and olfactory modalities. This aesthetic process is so commonplace that we rarely reflect on it or wonder why we hold such preferences, yet we currently know remarkably little about these questions. These issues represent frontier topics in contemporary psychological research (Palmer et al., 2013), as evidenced by a special issue of *Nature* (Issue 526) dedicated to exploring them (e.g., Brody, 2015; Wald, 2015).

Faces serve as sophisticated, complex visual stimuli containing rich information about gender, age, emotion, and aesthetic quality, playing a vital role in social interaction. Facial aesthetics, particularly, holds an irreplaceable function in critical social decisions including mate selection, friendship formation, job seeking, and social exchange, occupying a central position in the scientific study of visual aesthetics. Since the inception of scientific research on beauty, investigators have continuously explored facial attractiveness (Brielmann & Pelli, 2018). In these studies, the concepts of facial beauty and facial attractiveness are essentially interchangeable (Zhang Xiaojiang et al., 2015).

Previous research on facial attractiveness has primarily examined facial features (e.g., symmetry, averageness, sexual dimorphism cues) and observer characteristics (e.g., gender) from an evolutionary theoretical perspective, while largely neglecting the cognitive representation of facial attractiveness. Moreover, past studies predominantly used static facial stimuli, with research on more ecologically valid dynamic facial attractiveness only recently emerging. Some studies

have found that dynamic faces are more attractive than static ones, yet the reasons remain unknown. Therefore, questions concerning how people represent facial attractiveness and how dynamic cues enhance it urgently require resolution.

1.1.1 Effects of Facial Features

Numerous studies have demonstrated that attractiveness ratings of single static faces are influenced by several facial characteristics, including symmetry, averageness, and sexual dimorphism (see reviews by Fink & Penton-Voak, 2002; Li Ou & Chen Hong, 2010; Little et al., 2011; Rhodes, 2006). Facial symmetry refers to the similarity between left and right hemifaces, with people generally preferring highly symmetrical faces (e.g., Baudouin & Tiberghien, 2004; Bertamini et al., 2019; Perrett et al., 1999). However, other researchers hold different views. Biological research indicates that due to environmental instability and developmental pressures, human faces inevitably exhibit fluctuating asymmetry —random deviations from perfect symmetry similar to those found in human skeletons and physical forms (Gateno et al., 2018; Graham & Ozener, 2016). Since we encounter asymmetrical faces daily, such fluctuating asymmetry may not affect our perception of attractiveness. Indeed, many studies have found that symmetry does not enhance and may even reduce facial attractiveness (e.g., Farrera et al., 2015; van Dongen, 2014; Zaidel & Deblieck, 2007).

Averaged faces are composite images created by mathematically averaging multiple faces through computer technology. Research shows that averaged faces are more attractive than the original faces (Thornhill & Gangestad, 1993), with a meta-analysis (Rhodes, 2006) revealing a large effect size for averageness on attractiveness. Sexual dimorphism cues refer to masculine or feminine features reflecting secondary sexual characteristics in adult faces post-puberty (Little et al., 2011). Feminine female faces are highly attractive (e.g., Rhodes, 2006; Yang et al., 2015), yet no consensus exists regarding preferences for masculine dimorphism in male faces. Some studies suggest masculine male faces are more attractive (e.g., Little et al., 2011; Rennels et al., 2008), while others find women prefer more feminine male faces (Little & Hancock, 2002; Penton-Voak et al., 2004).

Additional physical features also influence facial attractiveness, including skin color and texture (e.g., Jones et al., 2004; Vera Cruz, 2018), which serve as important cues for subjective health judgments (Fink et al., 2012; Tan et al., 2018). Women with large eyes, full lips, small noses, narrow chins, and prominent cheeks are perceived as more attractive (Baudouin & Tiberghien, 2004; Fink & Penton-Voak, 2002; Rhodes, 2006). Faces with higher contrast around the eyes are more attractive than identical faces with lower eye-area contrast, and increasing eye-area contrast through attentional mechanisms can also enhance attractiveness (Störmer & Alvarez, 2016).

1.1.2 Effects of Social Information

Social information conveyed by faces also affects attractiveness, including gaze direction (e.g., Wen Fangfang & Zuo Bin, 2011), emotional expression (e.g., Zhang Lili et al., 2016), and self-similarity (DeBruine, 2005). Additionally, ascribed social information influences attractiveness judgments. A "what is good is beautiful" phenomenon exists, whereby individuals judged as good are also rated as more attractive (e.g., Little et al., 2006; Wang et al., 2020; Wang Yuqing et al., 2015). For instance, faces labeled with positive Big Five personality traits receive higher attractiveness ratings than those labeled with negative traits (Wang Yuqing et al., 2015). "Warmth" information significantly enhances the attractiveness of feminine male or female faces, while "competence" information significantly enhances the attractiveness of masculine male faces (Wang et al., 2020). These social information effects also influence the attractiveness of faces similar to familiar ones through halo and generalization effects (Han Shangfeng et al., 2018).

1.1.3 Observer Factors

Various biological, psychological, and social factors of observers affect facial attractiveness evaluations (see review by Kou Hui et al., 2013). For example, Williams and Morland (1976) found that social learning influences facial attractiveness preferences. Both African American and White preschool children in the United States preferred lighter skin tones, likely resulting from social learning experiences in a multi-racial society where darker skin is associated with poverty and lower education. Asians show stronger preferences for lighter skin than Whites and African Caribbeans, possibly because they have internalized their sociocultural preferences (Swami et al., 2013).

1.1.4 Processing Mechanisms of Facial Attractiveness

Researchers have examined the processing mechanisms of facial attractiveness from a cognitive perspective. First, facial attractiveness may relate to processing fluency: the more fluently observers process a stimulus, the more positive their aesthetic response (Reber et al., 2004). Mere exposure generally increases liking ratings for faces (Rhodes et al., 2001), likely because exposure increases familiarity and processing fluency. Symmetrical and average faces are considered attractive because they more closely match our mental prototype of faces, making them easier for our visual system to process (DeBruine et al., 2007).

Second, a few researchers have investigated facial attractiveness mechanisms from holistic versus local processing perspectives. Studies using the composite effect paradigm find that people employ holistic processing when judging the attractiveness of upright faces (Abbas & Duchaine, 2008): when the upper half of an upright face aligns with an attractive lower half, it is rated more attractive than when aligned with an unattractive lower half, but this effect disappears when the halves are misaligned. A recent study found that low-attractiveness

faces become more attractive when rotated 90° or 180° than when upright (Leder et al., 2017) because rotation disrupts holistic facial information (eyes above nose, nose above mouth) (Freire et al., 2000), suggesting that local processing of rotated faces can enhance the attractiveness of low-attractiveness faces. Two recent studies (Orghian & Hidalgo, 2020; Sadr & Krowicki, 2019) also found that presenting only partial facial information (e.g., left/right hemiface) through occlusion can increase attractiveness ratings. Liu et al. (2021) provided direct evidence that left or right hemiface attractiveness ratings are higher than whole-face ratings.

1.2 Dynamic Enhancement of Facial Attractiveness

For decades, facial attractiveness research focused primarily on static images. Over the past 15 years, however, researchers have turned their attention to more ecologically valid dynamic faces, finding that dynamic faces are more attractive than static ones.

Early studies revealed gender differences in the dynamic enhancement of attractiveness. Facial motion significantly enhanced male attractiveness but had no significant effect on female faces (Penton-Voak & Chang, 2008) and even decreased female facial attractiveness (Lander, 2008). Rubenstein (2005) used a between-subjects design to compare dynamic and static neutral-expression female faces and also found no effect of motion on female attractiveness. Researchers explained these gender differences through social factors: dynamic cues may only affect male attractiveness because female attractiveness depends more on physical features reflecting youth and fertility that are already evident in static faces, whereas male attractiveness is more strongly influenced by emotional and personality information that dynamic faces can better convey (Penton-Voak & Chang, 2008).

Other studies, however, found dynamic enhancement effects for both male and female faces (Kościński, 2013; Post et al., 2012). Post et al. (2012) used video clips from natural contexts and all their static frames as stimuli, finding that participants rated faces in ecological videos as more attractive than their static frames. Kościński (2013) compared attractiveness ratings of faces in videos, video stills, and frontal photographs, finding that faces in videos received the highest attractiveness ratings.

This dynamic enhancement may stem from motion' s effects on facial features. Morrison et al. (2007) used line animations to simulate male and female faces, finding that dynamic female faces were rated more attractive when their motion cues were more readily identified as feminine, with no such effect for male faces—a result consistent with research on how sexual dimorphism influences attractiveness (see review by Rhodes, 2006). Morrison et al. (2010) also found that increased sexual dimorphism enhanced the attractiveness of dynamic female faces. Thus, dynamic enhancement may occur because motion influences perceived sexual dimorphism. Hughes and Aung (2018) asked participants to

judge the symmetry and attractiveness of dynamic and static faces, finding that attractiveness increased when motion enhanced facial symmetry and decreased when it reduced symmetry, suggesting that motion enhances attractiveness by altering facial symmetry. Additionally, dynamic enhancement may relate to cognitive processing. Post et al. (2012) found that even when presenting all static frames simultaneously, playing videos inverted or in reverse order, participants still rated dynamic videos as more attractive than static frames. However, when video frames were presented in scrambled order, attractiveness ratings dropped significantly. Therefore, they concluded that sequential presentation is key to dynamic faces' superior attractiveness, as it masks defects present in individual static frames and may be processed more easily by the brain than static faces.

2. Theoretical Framework

Despite extensive research on how feature information influences facial attractiveness, the importance of holistic information cannot be dismissed. The three major factors affecting facial attractiveness—symmetry, averageness, and sexual dimorphism cues—all contain configural information about faces. People encode spatial templates of faces through matrix coding of all previously encountered faces (Valentine, 1991). Symmetrical and average faces may more closely match these face-space templates and conform to our configural representations of faces, thereby possessing high attractiveness. Furthermore, features like eye size, lip thickness, and chin width affect the spatial distances between facial features. Therefore, holistic representation of facial attractiveness cannot be ruled out.

Second, although few studies have examined holistic processing of facial attractiveness, research using the composite effect paradigm (Abbas & Duchaine, 2008), inverted faces (Leder et al., 2017), and partial face presentation (Liu et al., 2021; Orghian & Hidalgo, 2020; Sadr & Krowicki, 2019) consistently shows that disrupting holistic facial information affects attractiveness judgments. This suggests that facial attractiveness representation may depend on holistic facial information. Additionally, holistic processing of other facial attributes—including identity (see review by Richler & Gauthier, 2014), expression (Calder et al., 2000), and gender (Zhao & Hayward, 2010)—provides indirect support for holistic representation of facial attractiveness.

Based on the importance of holistic information for facial attractiveness representation and evidence for holistic processing of dynamic facial identity (e.g., Zhao & Bülthoff, 2017; Zhou et al., 2021), dynamic enhancement of facial attractiveness may also involve holistic processing. Additionally, facial motion may enhance attractiveness by altering facial feature information (Hughes & Aung, 2018; Morrison et al., 2007; Morrison et al., 2010) or providing additional social information (Penton-Voak & Chang, 2008). In summary, this research proposes that facial attractiveness is holistically represented. This holistic representation can explain from a cognitive perspective how features like symmetry, averageness, and sexual dimorphism influence attractiveness, as well as why disrupting holistic information changes attractiveness ratings. Dynamic enhancement of

facial attractiveness occurs through motion' s effects on holistic processing, attention to holistic and feature information, and social information processing—consistent with the holistic representation view and with previous findings on how holistic processing, feature information, and social information affect static facial attractiveness.

3. Research Questions

Existing research has primarily examined how facial features, social information, and observer characteristics influence attractiveness, with only a few studies exploring processing mechanisms from cognitive and holistic processing perspectives. Regarding why dynamic cues enhance facial attractiveness, current research has focused on how facial motion affects features and cognitive processing. This study proposes that facial attractiveness is holistically represented and that dynamic enhancement occurs through motion' s effects on holistic processing, attention to holistic and feature information, and social information. Based on this framework, we propose the following research questions.

First, is facial attractiveness holistically represented? Previous research provides indirect support, but direct evidence remains lacking. As described in Section 1.1.4, few studies have examined whether facial attractiveness processing is holistic, and they have yielded contradictory conclusions (Abbas & Duchaine, 2008; Leder et al., 2017). As noted in Section 1.1.1, local facial features also influence attractiveness (Baudouin & Tiberghien, 2004; Fink & Penton-Voak, 2002; Rhodes, 2006; Störmer & Alvarez, 2016). Therefore, whether facial attractiveness is holistically represented requires empirical testing.

Second, does holistic processing underlie the dynamic enhancement of facial attractiveness? As mentioned above, facial identity processing is primarily holistic, and research has shown that dynamic facial identity is also processed holistically (e.g., Zhao & Bülthoff, 2017; Zhou et al., 2021). Thus, whether dynamic facial attractiveness involves holistic processing needs investigation. Dynamic enhancement may occur because holistic processing of dynamic facial attractiveness is stronger than that of static facial attractiveness.

Third, does attention contribute to dynamic enhancement of facial attractiveness? Attention may influence perception of holistic and feature information. For example, attention can increase eye-area contrast, thereby enhancing attractiveness (Störmer & Alvarez, 2016). Attention also affects perception of spatial frequency, location, brightness, and other attributes related to attractiveness (e.g., Carrasco et al., 2004; Gobell & Carrasco, 2005; Tse, 2005; Tse et al., 2011; Fink et al., 2001; Halit et al., 2000; Stephen & McKeegan, 2010). Motion captures attention (Franconeri & Simons, 2003), and research shows longer fixation times for elastically moving versus static faces (Xiao et al., 2014). Attentional patterns differ between dynamic and static faces: when viewing dynamic faces, people do not fixate on the eyes as with static faces but dynamically allocate attention to eyes, nose, or mouth—locations providing richer information (Vo

et al., 2012). These attentional differences may contribute to attractiveness differences between dynamic and static faces.

Finally, can dynamic enhancement of facial attractiveness be attributed to vitality? In aesthetics, "life" holds high aesthetic value for humans. Di Dio et al. (2020) found that participants rated sleeping faces in paintings as more aesthetically pleasing than dead faces. This influence of vitality on artistic aesthetics may also apply to real human faces. People can perceive vitality from motion (Chang & Troje, 2008; Frankenhuis et al., 2013; Rosa-Salva et al., 2016), and vitality constitutes a dimension of face perception (Koldewyn et al., 2014). Perceiving vitality in faces relates to social connection (Powers et al., 2014), and once a human face configuration is detected, the brain assesses its vitality to determine whether to allocate additional social-cognitive resources (Looser et al., 2013). Facial vitality may influence attractiveness through its social information content.

4. Research Design

This research aims to address unresolved questions about the cognitive representation of facial attractiveness and its dynamic enhancement mechanisms. Two major studies will investigate these issues from the perspectives of holistic representation and how dynamic cues enhance attractiveness through holistic processing, attention, and social information.

Study 1 will explore the cognitive representation of facial attractiveness from a holistic processing perspective, comprising four sub-studies examining spatial-frequency holistic representation, canonical configuration representation, "three courts five eyes" configuration, and brain-completion holistic representation.

Study 2 will investigate the mechanisms of dynamic enhancement from holistic processing, attention, and vitality perspectives, comprising three corresponding sub-studies.

4.1.1 Study 1.1: Spatial-Frequency Holistic Representation of Facial Attractiveness

Traditional Chinese aesthetics pursues a sense of hazy ambiguity. The poetic imagery in *Qin Feng· Jian Jia*—"The reeds are green, white dew turns to frost. The one I yearn for is by the water' s side" —still intoxicates readers today. Can this hazy quality also enhance facial attractiveness? Indeed, studies (e.g., Orghian & Hidalgo, 2020; Sadr & Krowicki, 2019) have found that blurred faces are more attractive than original faces. Hazy faces primarily manifest as low spatial-frequency faces. Spatial-frequency information affects face recognition (Goffaux & Rossion, 2006; Wang Yamin et al., 2011) and expression recognition (Stein et al., 2014; Wang Yamin et al., 2011). Low spatial-frequency information dominates configural processing, whereas high spatial-frequency information dominates featural processing (Collishaw & Hole, 2000; Goffaux & Rossion, 2006). If static facial attractiveness is holistically represented, low spatial-frequency

faces should be more attractive than high spatial-frequency faces. This study will manipulate facial spatial frequency and use rating tasks and adaptation paradigms to investigate how high spatial-frequency (clearer, more local features) versus low spatial-frequency (hazier, more holistic features) information influences static facial attractiveness, thereby exploring spatial-frequency holistic representation.

4.1.2 Study 1.2: Canonical Configuration Representation Through the Mediating Role of Facial Normality

As described in Section 1.1, facial averageness (e.g., Rhodes, 2006) and social learning (e.g., Swami et al., 2013) influence attractiveness. Stretched and distorted faces are less attractive than normal faces (Halit et al., 2000), and adapting to distorted faces shifts attractiveness standards toward the distorted faces (Rhodes et al., 2003). Face perception adaptation phenomena are reviewed by Zhang Xin and Jiang Zhongqing (2015). Therefore, faces conforming more closely to canonical configurations (e.g., average faces, sociocultural preferences learned through social experience) likely represent attractive faces. Disrupting canonical configuration may affect attractiveness. Normality may explain inconsistent results regarding symmetry' s effect on attractiveness. Manipulating symmetry through mirroring (e.g., Mentus & Markovic, 2016; Zaidel & Deblieck, 2007) may disrupt facial normality, failing to yield more attractive symmetrical faces. In contrast, blending mirrored faces with original faces (e.g., Rhodes et al., 1998) or remapping key points of original faces (e.g., Little et al., 2008; Perrett et al., 1999) may produce symmetrical faces that better conform to canonical faces, resulting in higher attractiveness. This study will manipulate facial symmetry and normality to examine whether normality represents attractive faces and its mediating role between symmetry and attractiveness.

4.1.3 Study 1.3: Holistic Configural Representation Through "Three Courts Five Eyes"

Study 1.2 examined the mediating role of canonical configuration between symmetry and attractiveness, which may correspond to the "three courts five eyes" configuration. This principle aligns with traditional Chinese facial aesthetics, representing ancient Chinese painters' generalization of universal patterns in attractive adult faces based on facial feature positions and proportions (see Wikipedia entry on "three courts five eyes" : https://zh.wikipedia.org/wiki/三庭五眼). "Three courts" divides the frontal face vertically into three equal sections: from hairline to eyebrow line, eyebrow line to nose base, and nose base to chin line. "Five eyes" divides the frontal face horizontally into five equal sections, with one eye-length as one section: the distance between the eyes equals one eye-length, and the area between the outer canthus vertical line and the external auditory meatus vertical line equals one eye-length, making five eye-lengths total. If static facial attractiveness is holistically represented, the holistic configural feature of distances between features should influence attractiveness, and

faces conforming to the "three courts five eyes" standard may represent Chinese people' s representation of attractive Chinese faces. This study will manipulate static facial configuration and use rating tasks and adaptation paradigms to examine whether "three courts five eyes" represents attractive faces.

4.1.4 Study 1.4: Brain-Completion Representation Through Feature Occlusion

The ancient Chinese poet Bai Juyi wrote the famous line, "Called a thousand times, she finally appears, still holding a pipa half-hiding her face." Recent studies (e.g., Orghian & Hidalgo, 2020; Sadr & Krowicki, 2019) have confirmed that this type of left/right hemiface occlusion can enhance facial attractiveness. Can other occlusion methods—such as wearing sunglasses, masks, or covering three-quarters of the face with a hand while leaving one eye visible—also enhance attractiveness? What is the underlying mechanism? If static facial attractiveness is holistically represented, people may "brain-complete" remaining features from local features, such as completing them with higher-attractiveness average features, thereby increasing attractiveness. This study will use rating tasks and adaptation paradigms to examine whether occluded faces enhance whole-face attractiveness and whether this enhancement results from people "brain-completing" the whole face.

4.2.1 Study 2.1: Holistic Processing of Dynamic Facial Attractiveness

As noted in Section 2, dynamic facial identity processing is also holistic (e.g., Zhao & Bülthoff, 2017; Zhou et al., 2021). Therefore, Study 2.1 will investigate whether dynamic facial attractiveness involves holistic processing and whether dynamic enhancement stems from stronger holistic processing of dynamic versus static facial attractiveness. Using the composite effect paradigm, the upper and lower face halves may be aligned or misaligned, and their attractiveness may be consistent or inconsistent. Participants will judge the attractiveness of the upper face half. The hypothesis predicts that holistic processing will be stronger for dynamic than static facial attractiveness, evidenced by greater effects of alignment and consistency on dynamic versus static faces.

4.2.2 Study 2.2: The Role of Attention in Dynamic Facial Attractiveness Judgments

As described in Section 3, motion captures attention (Franconeri & Simons, 2003), and attention influences perception of many attributes (e.g., Carrasco et al., 2004; Gobell & Carrasco, 2005; Störmer & Alvarez, 2016; Tse, 2005; Tse et al., 2011). Moreover, people fixate longer on elastically moving than static faces (Xiao et al., 2014). Therefore, Study 2.2 will use attentional distraction paradigms combined with eye-tracking technology to explore fixation patterns for dynamic versus static faces and whether attention causes dynamic enhancement of facial attractiveness. The hypothesis predicts that dynamic faces will be more attractive than static faces, with attention moderating the effect of face

type on attractiveness. Compared to static faces, dynamic faces will receive longer fixation durations, with fixations more concentrated on moving facial regions.

4.2.3 Study 2.3: The Influence of Vitality on Dynamic Facial Attractiveness

Chinese painting and calligraphy value "vivid rhythm and spirit," transforming stillness into motion to depict inner vitality and enhance aesthetic appeal. Does vitality perception also influence the attractiveness of dynamic versus static faces? The French philosopher Voltaire proposed the motto "life is movement." Physical health can be maintained through motion, and health relates to attractiveness (see review by Fink & Penton-Voak, 2002). Infants and chicks show social preferences for accelerating chase movements, which adults interpret as reflecting vitality (e.g., Frankenhuis et al., 2013; Rosa-Salva et al., 2016), suggesting vertebrates may have spontaneous preferences for life properties. Humans can also perceive vitality in faces (Looser et al., 2013). As a dimension of face perception (Koldewyn et al., 2014), vitality may influence facial attractiveness through its social information content. This study will combine questionnaire methods, experimental approaches, and structural equation modeling to examine how vitality affects dynamic and static facial attractiveness.

5. Summary

Humans continuously seek objective laws of aesthetic perception. Ancient people conveyed their aesthetic perceptions and standards through poetry and artistic works, while scientists have explored various factors influencing facial attractiveness. Nevertheless, we still do not understand how facial attractiveness is represented, what attractiveness differences exist between the dynamic faces we encounter daily and static faces, or what mechanisms underlie these differences. The current research attempts to explore the cognitive representation of facial attractiveness and the mechanisms through which dynamic cues enhance attractiveness using adaptation paradigms, eye-tracking technology, and structural equation modeling.

Integrating the Chinese traditional aesthetic concept of "harmonious integration," this research comprehensively examines holistic representation of static facial attractiveness. It explores holistic and canonical representation through "hazy beauty" in high versus low spatial frequencies, proposes possible canonical configural representation through the mediating role of normality between symmetry and attractiveness, further investigates Chinese representation of high-attractiveness faces through the "three courts five eyes" configuration, and examines brain-completion holistic representation when holistic information is partially occluded through "half-hiding the face while holding a pipa."

Since both static (see review by Richler & Gauthier, 2014) and dynamic facial identity (e.g., Zhao & Bülthoff, 2017; Zhou et al., 2021) are holistically

processed, this research also explores holistic processing of dynamic facial attractiveness. By examining differences in holistic processing between dynamic and static faces, it investigates the causes of attractiveness differences, providing more detailed evidence for holistic processing of facial attractiveness. Additionally, this research examines how attention allocation and facial vitality influence our perception of facial attractiveness.

Theoretically, the ability to appreciate beauty represents a high-level human intelligence. This research' s investigation into the cognitive representation of facial attractiveness and the enhancement mechanisms of dynamic cues will help us further understand the high-level intelligence underlying human aesthetic appreciation. In practical applications, this research holds important value for facial attractiveness in daily interpersonal interactions and artificial intelligence. Clarifying the cognitive mechanisms of facial attractiveness, understanding its causes, and mastering methods to enhance it will help people improve social interaction effectiveness. Furthermore, this research can provide insights for algorithms enabling machines to judge facial beauty, with applications in photo-editing software like Meitu Xiuxiu.

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Note: Figure translations are in progress. See original paper for figures.