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Abstract

The human face communicates an impressive number of visual signals. Although adults' ratings of facial attractiveness are consistent across studies, even cross-culturally, there has been considerable controversy surrounding attempts to identify the facial features that cause faces to be judged attractive or unattractive. Studies of physical attractiveness have attempted to identify the features that contribute to attractiveness by studying the relationships between attractiveness and (a) symmetry, (b) averageness, and (c) nonaverage sexually dimorphic features (hormone markers). Evolutionary psychology proposes that these characteristics all pertain to health, suggesting that humans have evolved to view certain features as attractive because they were displayed by healthy individuals. However, the question remains how single features that are considered attractive relate to each other, and if they form a single ornament that signals mate quality. Moreover, some researchers have recently explained attractiveness preferences in terms of individual differences that are predictable. This article briefly describes what is currently known from attractiveness research, reviews some recent advances, and suggests areas for future researchers' attention.

Keywords

face; attractiveness; mate choice; evolutionary psychology

An obsession with beauty is not unique to modern Western culture but can be found around the world in almost all societies that have been studied. Several studies have shown that members of different ethnic groups share common attractiveness standards, suggesting that the constituents of beauty are neither

arbitrary nor culture bound. Beauty and sexual attractiveness seem to be almost interchangeable concepts, and people of different social classes, ages, and sexes tend to rate human faces similarly. Evolutionary psychologists have suggested that such a ubiquitous phenomenon as beauty may reflect human psychological adaptations and mate preferences. Certainly, the high consensus of people's judgments of facial attractiveness is consistent with the theory of biologically based standards of beauty. Evolutionary psychology has focused on the perception of three major cues that may underpin biologically significant assessments of mate value: (a) symmetry, (b) averageness, and (c) nonaverage sexually dimorphic features.

SYMMETRY

Bilateral symmetry of physical traits is hypothesized to reflect an overall high quality of development, especially the ability to resist environmental perturbations during development. Hence, a symmetrical face may signal the ability of an individual to cope with the challenges of his or her environment. Symmetry of bilateral traits is positively correlated with genetic heterozygosity (i.e., the presence of different variants of a gene on homologous chromosomes) in many animals, including humans, and may signal an outbred mate or provide information on an individual's genetic diversity in defense against parasites. Numerous studies have demonstrated that assessments of attractiveness are sensitive to facial symmetry. Preferences for symmetric faces may thus have some adaptive value.

Despite several studies demonstrating the direct effects of symmetry on rated attractiveness, other research suggests that symmetry can be associated with attractiveness for reasons other than direct effects of symmetry per se. Scheib, Gangestad, and Thornhill (1999) found a relationship between women's attractiveness ratings of faces and symmetry even when symmetry cues were removed by presenting only the left or right half of each face. These results suggest that attractive features other than symmetry can be used to assess physical condition. Symmetry may simply covary with these other features rather than acting as a primary cue to attractiveness. Other researchers have offered an alternative account of the symmetry-attractiveness link, arguing that symmetry is more readily perceived by the visual system than other perceptual cues are. Consequently, it may be the case that the human preference for facial symmetry is not the result of evolved psychological adaptations, but rather is a by-product of the perceptual system's design.

AVERAGENESS

Preference for average traits in some facial features could have evolved because in many heritable traits, the average denotes heterozygosity. Studies indicate that computer-generated average faces are rated as more attractive than almost all of the individual faces they are constructed from. It has been known for some time, however, that average faces can be made more attractive by manipulating specific features to make them nonaverage. In a recent study, however, Halberstadt and Rhodes (2000) found a strong relationship between averageness and attractiveness also for nonface objects like drawings of dogs, birds, and watches. It may be that humans have a general attraction to prototypical exemplars, and that their attraction to average faces is a reflection of this more general propensity. Exactly what features contribute to the preference for averageness, and whether these effects represent an adaptation or by-products of other adaptations, remains unclear.

HORMONE MARKERS

In many species, including humans, testosterone production and metabolism mobilizes resources to encourage males to attract and compete for mates. Testosterone affects a number of facial features. In pubertal males, a high testosterone-to-estrogen ratio facilitates the lateral growth of the cheekbones, mandibles, and chin; the forward growth of the bones of the eyebrow ridges; and the lengthening of the lower facial bone. Because testosterone suppresses the immune system, such "masculine" traits may represent an honest signal of quality, as the individual with high testosterone has successfully coped with its somewhat debilitating effects.

Hormone markers are also present in females. The signaling value of many female body features is linked to age and reproductive condition, both of which correspond to a woman's ratio of estrogen to testosterone. Attractive features (e.g., prominent cheekbones) correspond to high ratios and signal fertility, but estrogen in women could be a handicapping sex hormone as testosterone is in men. Thus, markers of high estrogen may reliably signal that a female's immune system is of such high quality that it can deal with the toxic effects of high estrogen.

In this context, skin condition is presumed to reliably signal aspects of female mate value. Human males, universally, are expected to

be most sexually attracted by female skin that is free of lesions, eruptions, warts, moles, cysts, tumors, acne, and hirsutism. The absence or presence of body hair is a sexually dimorphic characteristic, and relative hairlessness and smooth skin in women may signal fertility because of its association with low androgen and high estrogen. Skin infection may denote a disturbance of the production of androgen and estrogen and reduced reproductive ability. Empirical evidence shows that women's facial skin texture affects males' judgments of their facial attractiveness, and homogeneous (smooth) skin is most attractive (Fink, Grammer, & Thornhill, 2001). Males evaluate females' skin texture in addition to the characteristics of age and facial shape in judging facial beauty.

The link between hormone markers and attractiveness in male faces is, however, complex. Although some studies support the hypothesis that women prefer masculinized male faces, other studies indicate that women do not have clear preferences for such traits in males. Perrett et al. (1998) showed that females' preferences regarding male faces are apparently driven by stereotypical personality attributions: Highly masculinized male faces were perceived as less warm, less honest, and more dominant than feminized male faces. Such attributions may have a kernel of truth, as high testosterone has been linked with antisocial behavior in men.

However, the variability in women's preferences for hormone markers seems to represent some of the best evidence for evolved adaptations in the facial attractiveness literature. The studies demonstrating this variability fall into two categories, those investigating the influence of menstrual-cycle phase on women's preferences in male faces and those investigating individual differences in perceptions of the attractiveness of men's faces. Varying female preferences may reflect alternative tactics in a conditional mating strategy that trades off cues to supposedly good genes against other factors, such as sociability.

ATTRACTIVENESS AND THE MENSTRUAL CYCLE

The menstrual phase has been shown to influence females' perception of male attractiveness. Specifically, females exhibit a shift in preference toward a more masculine male face during the phase of their menstrual cycle when likelihood of conception is high (Johnston, Hagel, Franklin, Fink, & Grammer, 2001; Penton-Voak et al., 1999). Trends in the data indicate that this shift may be influenced by a woman's relationship status (i.e., women show larger shifts toward masculinity when judging attractiveness in the context of a potential short-term relationship than in the context of a potential long-term relationship). Furthermore, women in relationships tend to show larger cyclic shifts than women who are not in relationships.

These shifts in preferences have been interpreted as representing adaptive trade-offs in mate choice. Females choose a relatively feminine face (possibly indicating prosociality, or acting in ways that tend to benefit other people without the prospect of an external personal benefit, and willingness to invest in offspring) when they are unlikely to conceive, yet may prefer more masculine faces when sex is likely to result in pregnancy (so that they may gain heritable benefits). Taken together, these studies provide strong evidence for a hormone-mediated adaptive design. A female's attraction to testosterone markers on a male's face may be influenced by her estrogen/progesterone ratio. This suggests that the neural mechanism responsible for generating positive feelings toward male faces is sensitive to levels of hormones circulating in the blood.

INDIVIDUAL DIFFERENCES IN PERCEPTIONS OF ATTRACTIVENESS

Clearly, individual differences in attractiveness judgments exist, as not all people find exactly the same faces attractive. Recently, however, studies have indicated that certain psychological factors influence preferences in a predictable way. Johnston et al. (2001) compared women who scored low on a psychological "masculinity" test with those who received higher scores and found that the low scorers showed a larger preference shift across the menstrual cycle, had lower self-esteem, and had a greater preference for male facial dominance cues in potential short-term mates. Johnston et al. supposed that father-daughter bonding could enhance a female's self-esteem and reduce her sensitivity to male dominance cues, whereas a lack of attachment could have the reverse effect. Additional evidence for experiential influences on attractiveness judgments comes from a recent study (Perrett et al., 2002) demonstrating that, in adulthood, the offspring of older parents were less impressed by youth in a potential partner than were the children of younger parents.

Moreover, in a study comparing females who did and did not consider themselves to be physically attractive, those who considered themselves physically attractive showed a greater preference for two proposed markers of quality in male faces: masculinity and symmetry (Little, Burt, Penton-Voak, & Perrett, 2001). This finding

can be interpreted in terms of a conditional strategy, as this increased preference for masculine faces was seen only when judgments were made in the context of a long-term relationship. Potentially, women with high mate value may be able to elicit different behaviors from masculine-looking men than women with lower mate value. Recently, a similar varying preference for masculinity has been found using women's facial attractiveness and waist-to-hip ratio, rather than self-rated attractiveness, as the putative measures of female viability.

BEAUTY: A SINGLE ORNAMENT OF MATE QUALITY?

Symmetry, averageness, and hormone markers probably have interacting effects on the perception of attractiveness. The question of how these features relate to one another, then, is important. Research has focused mainly on the analysis of single features and their contribution to attractiveness, but this approach may be inherently limited, as attractiveness may not be reducible to the analysis of a single feature. The ecological literature suggests two alternative explanations of how features relate to one another: the *multiple-message hypothesis* and the *redundant-signal hypothesis* (Møller & Pomianowski, 1993). According to the former, each ornament signals a specific, unique property of the condition of an individual. This hypothesis corresponds to the *multiple-fitness model* of Cunningham, Roberts, Wu, Barbee, and Druen (1995), which states that perceived attractiveness varies across multiple dimensions, rather than a single dimension, with each feature signaling a different aspect of mate value.

The redundant-signal hypothesis also suggests that there are multiple features, each signaling a different aspect of mate quality, but adds that these features are considered against one another in arriving at an evaluation. That is, according to this hypothesis, mate choosers pay attention to several sexual ornaments in combination to obtain a better estimate of general condition than if they paid attention to any single ornament. In a recent study, Grammer, Fink, Juette, Ronzal, and Thornhill (2001) showed that this hypothesis is better than the multiple-message hypothesis for explaining how signals actually contribute to female attractiveness, although its validity for the assessment of male attractiveness remains to be investigated. Support for the redundant-signal hypothesis also comes from Thornhill and Grammer (1999). They asked participants to judge the attractiveness of the same women in each of three poses (face, front nude with face covered, and back nude) and found a significant positive correlation between the ratings for the three poses in both Austrian and U.S. participants. Because the attractiveness features of the face, back, and front are all related to estrogen, the correlation of the ratings of the different pictures implies that women's faces and bodies form what amounts to a single ornament of honest mate value.

BEAUTY HAS A REWARD VALUE

Another influential component of attractiveness is eye gaze, as eye contact is an important part of social interaction. Gaze provides different levels of meaning (e.g., social attention or even "mind reading" through eye gaze) depending on the status, disposition, and emotional state of the sender and receiver of the contact. In an experiment in which participants viewed faces varying in attractiveness and direction of eye gaze, Kampe, Frith, Dolan, and Frith (2001) showed that brain activity in the ventral striatum (a brain area associated with prediction of reward) reflected an interaction of the two variables. Specifically, when eye gaze was directed toward the viewers, activity in the ventral striatum increased as attractiveness increased, and when eye gaze was directed away from the viewers, activity in this area decreased as attractiveness increased. Thus, depending on the direction of gaze, perceived attractiveness can activate brain regions that are strongly linked to reward, and eye contact with attractive individuals appears to be more "rewarding" than eye contact with less attractive individuals.

This finding has been confirmed by Aharon et al. (2001), who showed that discrete categories of beautiful faces have differing reward values and differentially activate reward circuitry in human subjects. Functional magnetic resonance imaging shows that passive viewing of beautiful female faces activates the brain's reward circuitry, but studies in which the attractiveness of male faces was rated indicate that aesthetic evaluation may be separate from reward assessment.

CONCLUSION

If we accept that evolutionary processes have shaped our psychological adaptations, it seems likely that human beings evolved mechanisms for detecting and assessing cues of mate value. Furthermore, these mechanisms are presumed to be highly resistant to cultural modification, although many cultural

markers of attractiveness (e.g., body decoration) clearly contribute to interpersonal attraction. Recently, research has indicated that cues to attractiveness are integrated to form a single ornament of mate value. The slightest introspection, however, informs us that individuals differ in their judgments of attractiveness. Such individual differences may reflect the operation of adaptive conditional mating strategies that trade off cues to genetic and direct benefits, as well as individual differences in experience across the life span.

Despite the general consensus among evolutionary psychologists that facial attractiveness reflects adaptations that discriminate the mate value of individuals, there are still open questions that remain to be solved. Future research should direct further attention to how variations in life history affect attractiveness judgments. Also, we take it for granted that features like facial symmetry, facial averageness, and hormone markers reflect immune-system competence, but research is still needed to provide empirical evidence for this assumption. However, to date, the adaptationists' perspective seems to provide a fruitful framework that should help us to gain further insight into the question whether beauty is only "skin deep" or rather lies in the adaptation of the beholder.

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Note

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