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In human communication and mate selection the appearance of health sends signals regarding biological fitness. We compared the appearance of health in the sides of the face to previous results on left–right facial asymmetry in the appearance of beauty (1). The stimuli were created by aligning the left and right sides of the face each with its own mirror image. Here, participants viewed 38 pairs of left–left and right–right faces and judged which member of the pair looked healthier. No significant interaction emerged between decision (health vs attractiveness) and face side. Rather, in women’s faces right–right was significantly more healthy and attractive than left–left, while in men’s faces there was no significant left–right difference. In biology and evolution, health and beauty are closely linked and the findings here confirm this relationship in human faces. © 2001 Academic Press

Introduction

The human face has evolved to serve a multitude of basic cognitive, emotional, social, and biological functions. It is thus plausible that special neuronal structures have evolved to subserve these functions. When a face is viewed, the brain processes not only the identity of the individual, or lips and mouth movements, and emotional expressions, information about beauty and health are also perceived. This study was designed to explore possible relationships between health, facial attractiveness, and facial asymmetry. Our reasoning was that these factors play an important role in human mate selection. Previously, we found a sex-related asymmetry in facial attractiveness, with higher ratings for right–right composites of women’s faces than for left–left composites of the same faces, while there was no significant difference between right–right and left–left composites in men’s faces (1). We now wanted to

determine if the same sex-related asymmetry applies to perception of health in the identical composites.

Whether there is a relationship between beauty preferences and the perception of health in human faces as a function of brain asymmetry has not yet been investigated. Elaborate strategies within the animal kingdom to analyze the health of a potential mate have been repeatedly noted (e.g., 2). For example, consider the case of the peacock and the peahen. The peacock, like many other birds, has evolved to have a particularly long tail which, at first glance, does not appear to have any functional purpose. In fact, the peacock's tail is representative of secondary sexual characteristics. As Darwin noted regarding many species of birds, spectacular colors, feather modifications, and displays have no use in foraging, flying, or nest building. The answer most likely lies in mate selection consideration since research by evolutionary biologists suggests that secondary sexual characteristics are a reliable indicator of health quality (3). Folstad and Karter (4) and Wedekind (5) independently found that a link between parasite resistance and secondary sexual characteristics exists because sex hormones, especially testosterone, lower immunocompetence. So when the peahen is selecting a mate, she judges the size of the tail as well as the color and sheen of the peacock's feathers. Ideally, if these are not just so, she will not mate with that particular peacock. In other words, the peahen is using secondary sexual characteristics to assess the health of her potential mates (e.g., strong, healthy, agile, parasite resistant). Even though the peacock's tail does not enhance his ability to fly, it does increase his chances of reproductive success (everything else being equal). However, how the human brain assesses health in faces is not understood. In the present study, we were concerned with the link between facial beauty and health in the face of the observed and the mind of the observer.

There is paucity of data and discussion on how people perceive the health of others, whether in their faces or bodies. There is a small amount of literature which indicates that people sporting a tan are considered to be healthier than those who are pale (6, 7). In the only published study which directly addressed the relationship between facial attractiveness and health, Kalick et al. (8) found that ratings of adolescent facial attractiveness were not related to adolescent health during adolescence or later in life. The researchers also found that when comparing medical ratings of health to ratings made by participants, those who were relatively more attractive were mistakenly rated as healthier by the participants. Interestingly, when the researchers controlled for attractiveness, the correlation between actual health and perceived health increased implying that attractiveness may have been suppressing the accurate recognition of health.

In order to better understand the present experiment, one should have a basic understanding of what facial asymmetry means. Facial asymmetry, as referred to by other researchers, refers to the fact that the human face (women and men) is not morphologically symmetrical. This trait is not deemed to be pathological; rather, it is considered to be normal. Support for this comes from the fact that other methods in which actual morphological measurements of human faces were conducted revealed only relative asymmetry and no perfect symmetry of faces (9–12).

One important tool for studying the relationship between facial beauty and the brain of the perceiver has been right–right and left–left facial composites. These composites are created by manipulating photos that have been digitized on a computer so that each facial half and its mirror image are combined to produce a natural looking face, hence left–left and right–right. D. Zaidel has used this technique profitably to study the question of left–right organization of beauty in the human face and found asymmetry particularly in faces of women (1). The right side of women's faces was preferred over the left but no such difference was demonstrated in men's faces. These

findings are consistent with prior research which indicated that the right side of women's faces in painted portraits is preferred over the left side while there is no left-right preference for men's faces in painted portraits (13).

In the present study we extended the investigation of facial asymmetry to the perception of health. We have used the identical facial stimuli used previously in the attractiveness study.

Methods

Participants. Twenty-four right-handed undergraduate students (12 females, 12 males) enrolled in introductory psychology courses volunteered to participate in the experiment in exchange for partial course credit.

Materials. The stimuli were 38 pairs of faces (21 women, 17 men) consisting of left-left and right-right composites from previous experiments (1). Each face composite was created on a Macintosh computer from a head-on, symmetrically lit face, by aligning each facial half with its own mirror image, hence left-left and right-right.

Procedures. A trial consisted of viewing a pair of faces side-by-side on a Macintosh computer screen, left-left and right-right of the same individual, for 10 s. The task for each participant was to decide which member of the pair appeared healthier, or else there was no difference ("same" response). Women's and men's faces were intermixed within the series of 38 consecutive trials, and the laterality of the facial composite on the computer screen was counterbalanced within each face sex.

Results

The frequency of selecting the left-left or right-right was determined for each stimulus face across all the participants. Then, the data for the health judgments were compared to the attractiveness judgments from the previously published study (1) with two separate ANOVAs, one applied to women's faces and one to men's faces. Each repeated measures ANOVA had one between-subjects factor of Decision (healthy, attractive) and a within subject's factor of Side (left-left, right-right). The results of the ANOVA for either women's or men's faces revealed that the Decision \times Side interaction was not significant ($p > .85$). For women's faces there was a significant main effect for Decision ($F(1, 19) = 7.27, p < .01$) reflecting the higher ratings for health compared to attractiveness, regardless of Side, and a significant main effect for Side ($F(1, 20) = 6.84, p < .01$), reflecting the fact that right-right received significantly higher ratings than left-left, regardless of Decision. On the other hand, for men's faces there was only a significant main effect for Decision ($F(1, 16) = 9.12, p < .008$), reflecting higher rating for health than for attractiveness, regardless of side. There was no significant main effect for Side. Figure 1 illustrates the findings.

Discussion

It is important to note that the identical set of faces used to obtain judgment of health here was also used for the attractiveness judgment previously (1). Thus, the present results support the existence of sex-related, left-right asymmetry in human faces and they add strength to the theory that appearance of attractiveness and health are linked in the face of the observed and the mind of the observer. Evolutionary biology theory has maintained that with animals, attraction is closely linked to health

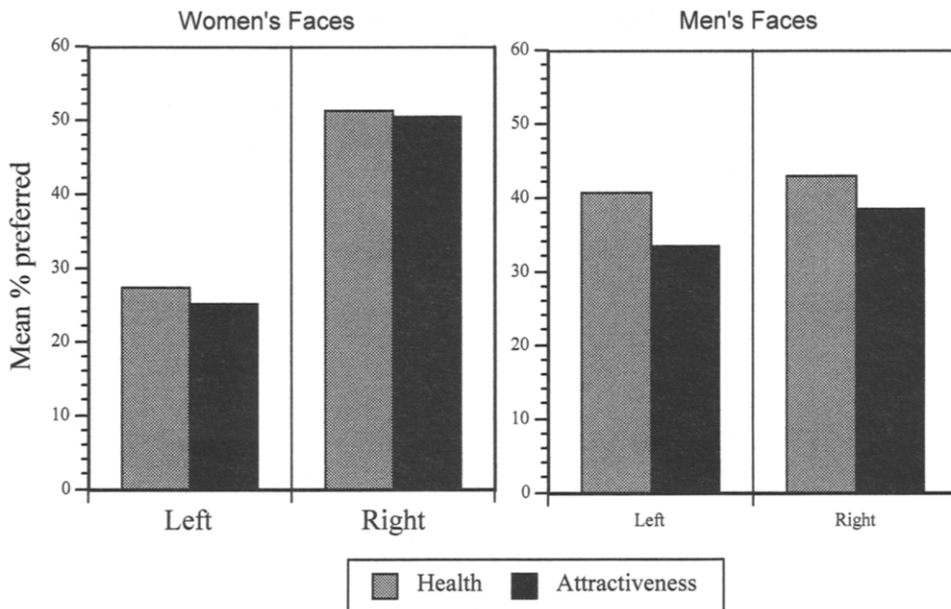


FIG. 1.

of the potential mate in order to ensure survival of offspring. We would expect the same principal to apply in humans as well.

Our hypothesis was that health and attractiveness are closely related and thus the right side of women's faces would be judged significantly healthier than the left side. Along the same lines, we also predicted that we would not find a preference for either side of men's faces. Not only did the results confirm our hypotheses, they also reflected the previous findings of Zaidel et al. (1) regarding the sex-related face attractiveness.

Moreover, cues for health embedded within normal facial asymmetry may be related to functional asymmetry in the brain. This would make sense from an evolutionary standpoint: If attractiveness is associated with health (be it honestly or otherwise), then those who display attractiveness will have a selective advantage. This will only work evolutionary well in the long run, however, if those perceiving these cues have evolved sufficient brain strategies for reliable detection of honestly correlated indicators of health.

The present findings also support previous research in social psychology which indicates that attractiveness is associated with such positive qualities as health and honesty. The results of the Kalick's study (8), to use an example, indicated that attractiveness may actually hinder accurate estimates of health. These differences in design underscore the need for more research to better understand how health is perceived by others and whether or not attractiveness is truly a reliable indicator of health in humans.

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