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Human (*Homo sapiens*) Facial Attractiveness and Sexual Selection: The Role of Symmetry and Averageness

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We hypothesized from the parasite theory of sexual selection that men (*Homo sapiens*) would prefer averageness and symmetry in women's faces, that women would prefer averageness and symmetry in men's faces, and that women would prefer largeness (not averageness) of the secondary sexual traits of men's faces. We generated computer images of men's and women's faces and of composites of the faces of each sex, and then had men and women rate opposite-sex faces for 4 variables (attractive, dominant, sexy, and healthy). Symmetry, averageness, and the sizes of facial features were measured on the computerized faces. The hypotheses were supported, with the exception of the hypothesized effects of averageness of female and male faces on attractiveness ratings. This is the first study to show that facial symmetry has a positive influence on facial attractiveness ratings.

Although adult facial attractiveness ratings are replicable, even cross-culturally (see reviews and discussions in Jones & Hill, 1993, and Langlois & Roggman, 1990), there has been considerable controversy around attempts to identify in research the facial features that actually cause faces to be judged attractive or unattractive. As discussed by Langlois and Roggman, studies of individual facial features (e.g., nose size) often have yielded inconsistent results between studies. Faces created by combining individual faces into composites have been shown to be more attractive than the individual faces, which is felt to be a preference for average facial features (Langlois & Roggman, 1990; Symons, 1979). Averageness of faces can be calculated metrically or constructed photogrammetrically. Galton (1879) constructed composites of individual pictures with the photographic method of simply projecting them one over the other on a negative. According to Galton, this method "enables us to obtain with mechanical precision a generalized picture; one that represents no man in particular, but portrays an imaginary figure possessing the average features of any given group of man" (1879, p. 341). Indeed, Treu (1914) had the impression that these composites are "singularly beautiful" (p. 441). However, as Alley and Cunningham (1991; see also Benson & Perrett, 1991) pointed out, composites are also more symmetrical and rather free of facial blemishes, and therefore one of these traits, rather than averageness per se, may be the cause of the enhanced attractiveness of composites. In addition, Alley and Cunningham emphasize that there is considerable evidence (e.g., Keating, 1985) that the most sexually attractive male faces are those that show extremes, not averageness, in certain features (e.g., wide jaw), felt to be perceived as dominance indicators. Our study of the cross-sex attractiveness ratings of faces of both sexes attempts to clarify adult facial beauty by examining the roles of facial symmetry and averageness and their interaction with individual dimensions of the face.

We use the theoretical framework of sexual selection. The prominent theory of sexual selection is the parasite theory, which proposes that sexual selection favors those traits that advertise resistance to parasites, both microparasites, such as bacteria and viruses, and macroparasites, such as nematodes and protozoa (Hamilton & Zuk, 1982). There is considerable evidence that parasite-resistant organisms win in competition for mates, both in intrasexual competition (usually males competing for females) and in being chosen by the opposite sex and that secondary sexual traits advertise parasite resistance (see partial reviews in Hausfater & Thornhill, 1990, and Zuk, 1992). According to the parasite theory of sexual selection, mate choice decisions include medical examinations of potential mates, and parasite-resistant organisms are preferred because they produce genetically resistant offspring or provide better parental care to the offspring. Thus, the parasite theory proposes that beauty of bodily form is perceived as a cue to high parasite resistance by animals in choosing mates.

Secondary sexual characters are evolved outcomes of sexual selection. There is a link between parasite resistance and secondary sexual traits because sex hormones, especially testosterone, lower immunocompetence (Folstad & Karter, 1992; Wedekind, 1992). Whereas high titers of testosterone are necessary for the production of large secondary sexual traits, there will necessarily be a positive correlation between development of secondary sexual

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traits and the quality of the immune system; only healthy organisms can afford the high testosterone handicap on the immune system that is necessary for the production of elaborate sexual traits (Folstad & Karter, 1992). The human face contains secondary sexual traits, that is, facial features that develop or increase in size at puberty under the influence of the sex hormones, androgens and estrogens. Enlarged jaws, chins, and cheekbones in men are examples of facial secondary sexual traits that are influenced by testosterone (Enlow, 1990; Tanner, 1978), and Thornhill and Gangestad (1993) hypothesized that largeness in these features are considered sexually attractive because of advertised immunocompetence.

Genetic diversity may be an important defense against parasites, both at the between-organisms level (i.e., the population level) and at the within-organisms level (see review in Thornhill & Gangestad, 1993; see also Hamilton, 1982; Tooby, 1982). Within-organisms genetic diversity is dependent on individual genetic heterozygosity. For heritable traits that are continuously distributed, heterozygosity correlates positively with average trait expression (Soulé & Cuzin-Roudy, 1982). Facial attractiveness is continuously distributed and probably is heritable (see Thornhill & Gangestad, 1993). This implies that average values of facial features reflect high heterozygosity. Thus, Thornhill and Gangestad hypothesized that facial averageness is attractive because of its association with heterozygosity and thus parasite resistance. This hypothesized pattern may primarily apply to female faces. The intrasexual sexual competition component of sexual selection involving dominance and combat has worked more strongly on males than on females in human evolutionary history (Darwin, 1871; Symons, 1979), and male faces have multiple, testosterone-facilitated secondary sexual traits (viz., adult male chin, cheekbones, brow ridge, and jaw) that are expected by the parasite theory to have evolved to signal health-related dominance by largeness. Multiple male facial features in which dominance is signalled by enlarged features may take precedence over averageness in men's facial attractiveness to women.

Symmetry of bilaterally represented traits is positively correlated with heterozygosity in many animals, including humans (see review in Thornhill & Gangestad, 1993). Thus, facial symmetry, like facial averageness, may display underlying heterozygosity and parasite resistance (Thornhill & Gangestad, 1993). Also, body bilateral symmetry seems to reflect overall quality of development, especially the ability of an organism's developmental machinery to resist genetic perturbations and the numerous environmental perturbations that occur during development (Leary & Allendorf, 1989; Parson, 1990, 1992; see review in Watson & Thornhill, 1994), which implies that a symmetrical face displays developmental homeostasis (Thornhill & Gangestad, 1993). The symmetry of bilateral secondary sexual characteristics is more sensitive to environmental perturbations during their development than is that of nonsexually selected bilateral traits (see review in Møller & Pomiankowski, 1993). This pattern of greater sensitivity of secondary sexual traits is seen in diverse animal taxa, including nonhuman primates (Manning & Chamberlain, 1993). Parasites have been shown to affect differentially the development of symmetry in organisms' traits, and the symmetry of secondary sexual traits is most negatively influenced (Møller, 1992; Møller & Pomiankowski, 1993; Watson & Thornhill, 1994). Symmetry of facial secondary sexual traits may display immunocompetence because the construction of such traits, especially large ones, is expected to require more sex hormone (Thornhill & Gangestad, 1993).

In this article we test the following hypotheses about facial attractiveness, which arise from these considerations: (a) Men prefer averageness and symmetry in women's faces; (b) women prefer averageness and symmetry in men's faces; and (c) women prefer extreme expression of the secondary sexual traits of men's faces. Our approach uses computer techniques to measure composite and individual faces to assess the influence of averageness, symmetry, and facial dimensions in facial attractiveness judgments.

Method

Rating Study

The raters of computerized faces were 52 female and 44 male college students (*Homo sapiens*) from a German university. The digitized facial pictures were presented to each subject individually by an interactive computer program. Order effects of presentation were controlled by presenting faces to raters in a randomized order. In a first run the program showed all pictures to each subject sequentially. In a second run the subject rated each picture for 11 adjectives on a rating scale from 1 (*least*) to 7 (*most*). The adjectives and their accompanying rating scales were displayed randomly with each picture at the bottom of the computer screen. The subjects were allowed to view pictures as long as they wished. For this study only 4 of the 11 adjectives were used: attractive, dominant, sexy, and healthy. The subjects were trained interactively by the computer before making ratings until they were able to solve the rating task.

Generation of Individual Test Photographs

The photographed subjects were different persons from the raters. Each subject (16 women, age $M \pm SD$ = 26.6 years ± 4.0, and 16 men, age $M \pm SD$ = 25.3 years ± 3.8) was seated upright in a chair with a light source on each side of the face in order to prevent shading. We carefully positioned each subject so that all were looking directly into the camera without any tilt of the head. Distance to the camera was constant. The picture was taken with a high-resolution video camera and digitized on a computer. The picture size was 600 × 570 pixels with a resolution of 72 pixels/2.54 cm. Faces were standardized in size on a video screen by cross-hairs that marked the horizontal midline of the mouth, the horizontal midline of the inner and outer eye corners, and two vertical lines at the center of the pupil. Faces were adjusted to fit in the cross-hairs with the zoom lens of the video-camera (Figure 1; also see Langlois & Roggman, 1990).

Generation of Composites

The 16 pictures of each sex were randomly paired, and a blended gray value was calculated for the corresponding pixels of each pair. For this calculation the arithmetic drawing mode *blend*

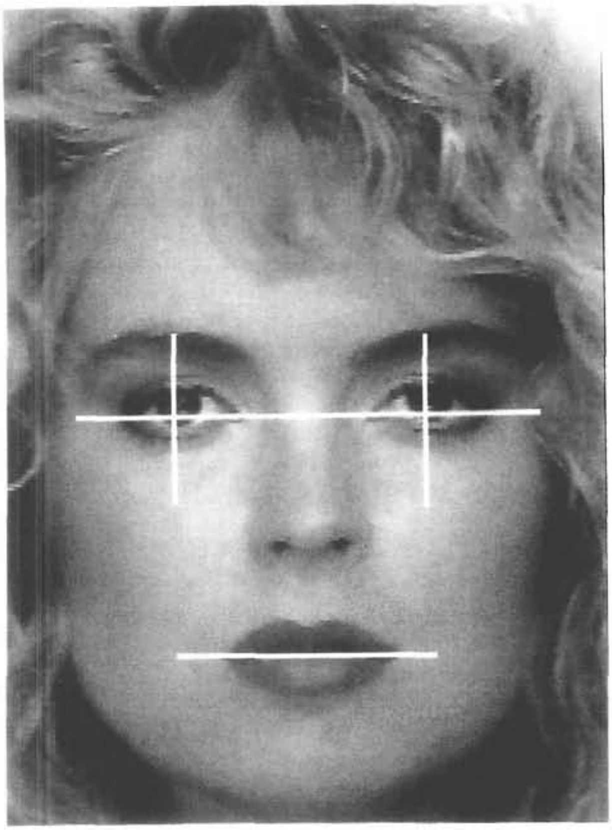

Figure 1. Pictorial of technique used to standardize facial size.

of ColorQuickDraw (part of System 7, Apple Computers, Cupertino, CA) was used. Blend applies the following formula to the two source pixels in a eight-bit drawing environment:

$$\text{New Pixel} = \text{Source 1} \times \text{Weight} \div 65536 + \text{Source 2} \times (1 - \text{Weight} \div 65536) \quad (1)$$

In an eight-bit drawing environment, there are 256 gray values and the weight of each photo was set to 50%. The gray value of the blended pixel corresponds to the arithmetic mean of the gray values of the original pair of pixels. Because the composites created by this technique appear blurred, the original photos were also blurred by randomly introducing pixels. Finally, the gray values of the composites were equalized and adapted in brightness and contrast to the original photos. This procedure presumably controls for the strong effect of skin texture on attractiveness ratings (Benson & Perrett, 1991). This was an important control in our study because we were trying to examine the effect of other factors, especially symmetry, in attractiveness.

For each sex this generated eight composites, each constituted from two originals of each sex (Figure 2). By combining these composites randomly in pairs, we created additional composites. The final test set of photographs for each sex consisted of 16 individual faces, 4 pictures combining the faces of four persons, 2 pictures combining eight faces, and one picture combining all 16 individual photos (Figure 3). Thus, the test set had 23 pictures for each sex.

Facial Measurements

Measurement points. The facial measurements were done on the computer screen with IMAGE 1.41 (shareware, National Institute of Mental Health, Bethesda, MD) at 76% of the original photo. This program measures and saves the coordinates of a selected pixel. We used 13 points, which were defined by distinct morphological structures of the face and thus could be identified reliably (Figure 4). The reliability of these points was examined by two methods. First, one of us placed the points on several faces three different times; point locations did not differ by more than one pixel. Second, a person unfamiliar with the research's hypotheses placed the points on each of 113 faces, and this was repeated by one of us without knowledge of the points placed by the naive assistant. The point locations had very high reliability: The zero-order correlation between the facial symmetries calculated from the points of the two raters was .80 ($p < .0001$). Points used included the outermost (P1 and P2) and the innermost eye corners (P3 and P4). The points for measuring the cheekbones (P5 and P6) were defined as the leftmost and rightmost pixels of the face on a horizontal line beneath the eyes. A comparable definition was made for the points for measuring the nose: P7 and P8 describe the leftmost and rightmost point of the nose in the lower nose region. Jaw width (P9 and P10) was measured as face width at the y coordinate of the mouth corners (P11 and P12). A final point was the chin boss (P13), or the lowest point of the chin curvature. In persons with a W-shaped chin boss, the middle point was used.

Calculation of asymmetry. We only dealt with horizontal asymmetry in this study. Facial asymmetry was calculated in two ways. Overall facial asymmetry (FA) was based on the sum of all possible nonredundant differences between the midpoints of six horizontal lines between the following pairs of points: P1–P2, P3–P4, P5–P6, P7–P8, P9–P10, and P11–P12. These six lines were designated D1, D2, D3, D4, D5, and D6, respectively (Figure 5). The midpoint of each line was calculated with the formula, ([Left Point − Right Point] ÷ 2) + Right Point. On a perfectly symmetrical face, all midpoints lie on the same vertical line, and the sum of all possible nonredundant midpoint differences is zero.

The second measure of facial symmetry, which we call central facial asymmetry (CFA), focuses on the differences between midpoints of adjacent lines, especially in the center of the face. CFA corresponds to the sum of the differences of the midpoints of the lines D1 and D2, D2 and D3, D3 and D4, D4 and D5, and D5 and D6. In our analysis we assume for simplicity that facial symmetry deviations are linear rather than nonlinear.

Calculation of averageness. Averageness of a face was determined in the following way. First, the mean lengths of each of the lines D1 through D6 were calculated for the 16 normal photos of each sex. Averageness of the vertical dimension for each sex was

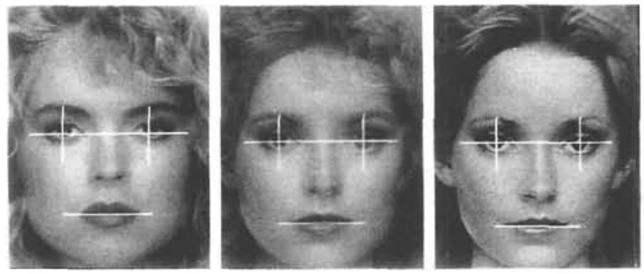

Figure 2. A two-face composite (center), with the original photographs on either side.

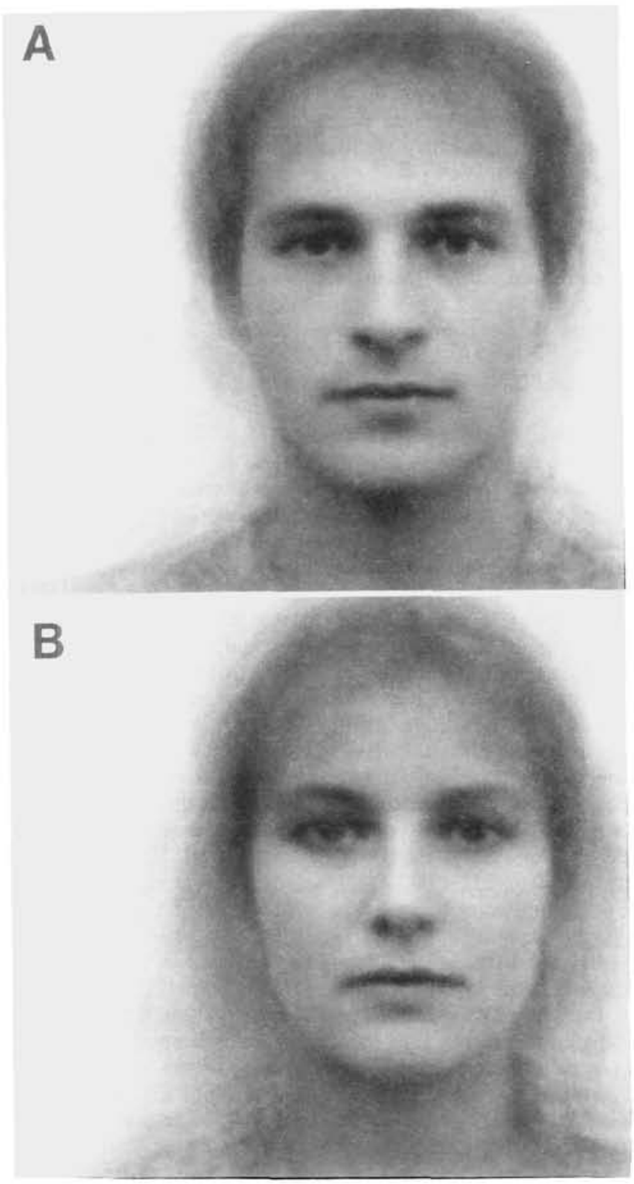

Figure 3. Sixteen-face composites of each sex.

calculated by the distance between P13 and the midpoint of D1 and the distance between P13 and the midpoint of D5. Then the absolute differences between these means for each sex and the length of each of the same lines in each individual face of the same sex were summed.

Calculation of metric facial dimensions. The sizes of nine facial features were calculated: distance between outer eye corners (D1), distance between inner eye corners (D2), mean eye size $([P3 - P1 + P2 - P4] \div 2)$, nose width (D4), facial width at cheekbones (D3), mouth width (D5), and jaw width (D6). In addition, we calculated average cheekbone prominence, $(P6 - P5 + P6 - P10) \div 2$. Cheekbones are more prominent when values are positive than when they are negative. Finally, lower face proportions describe the relation between face length and jaw width, Midpoint $D1 - P13 \div D6$. A high value indicates a long face with a narrow jaw; a low value indicates a face with a wide jaw.

Statistical Tests

All statistical significance levels reported in this study are two-tailed. All ratings and means of ratings for the faces follow normal distributions. The .05 level is the critical level for statistical significance.

Results

Composites Versus Normals: Attractiveness

The mean ratings of composites versus normal faces of each sex by opposite-sex raters were compared with *t* tests (Table 1). Female composites were judged significantly more attractive and sexier than normal photos. Also, female composites were judged significantly less dominant than normal female faces. There was not a significant difference in the health ratings of female composite versus normal faces, but female composites were rated healthier ($p = .10$). Normal male faces were rated as significantly healthier, sexier, and more dominant than composite male faces; the same pattern is seen for the adjective *attractive,* and this just missed statistical significance ($p = .06$). Thus, making

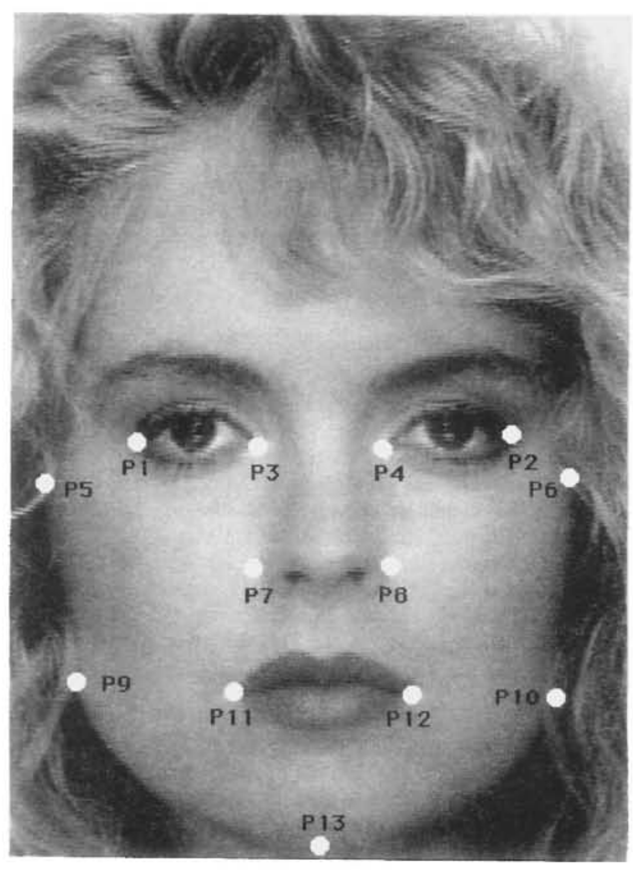

Figure 4. The landmark points used for facial measurements.

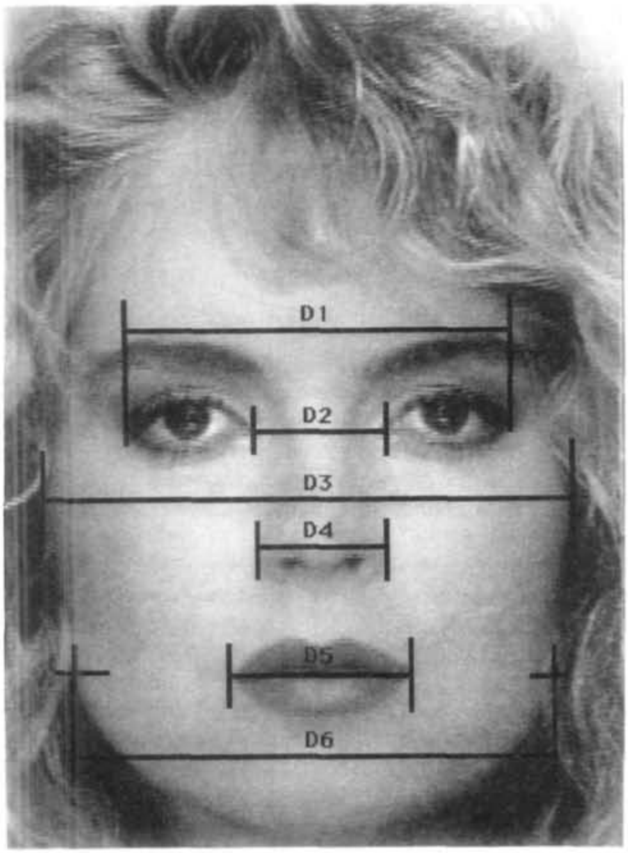

Figure 5. The lines used for facial measurements.

composites from individual female faces yielded pictures that were more attractive than the originals, but the reverse was the case for male photos. It is possible that normal faces of males were rated more positively because they more frequently contained more extreme values in facial features. Indeed, male composites were rated as less dominant.

The ages of normal subjects and the mean attractiveness ratings of their faces showed statistically insignificant correlations in each sex (16 females, $r = .13$, $p > .5$, and 16 males, $r = .22$, $p > .05$).

Composites Versus Normals: Averageness and Symmetry

As pointed out by Alley and Cunningham (1991), in comparison with normal photos, composites are more average in facial features but also show higher values in other traits, such as symmetry and smoothness of complexion (also Benson & Perrett, 1991). Thus, we measured metric averageness per se in composite and normal photos. Because of the small number of composites (7), a nonparametric comparison of median averageness for composite and normal pictures of each sex was conducted. For each sex the median deviation from averageness for composite faces was less than for normal faces but was not statistically significantly (16 normal faces vs. 7 composite faces for each sex, Mann-Whitney U test, $ps > .10$). However, the median for the differences from facial averageness for the individual women's faces was 52, but it was only 36 for the 16-face composite. This same pattern was seen for men. Individual male faces showed a median of 77, and the 16-face composite had a median of 54. Thus, our results indicate that computer averaging does not necessarily create statistically higher metrical averageness in faces and that the averaging effect in composites may depend on how many faces are added to form a composite.

Symmetry in composites and normal faces was also compared. Composites showed less asymmetry than the normal photos (Mann-Whitney U tests): FA for normal male faces, $Mdn = 67$, and for composite male faces, $Mdn = 41$, $p = .08$; FA for normal female faces, $Mdn = 54$, and for composite female faces, $Mdn = 25$, $p = .03$; CFA for normal male faces, $Mdn = 18.5$, and for composite male faces, $Mdn = 12$, $p = .05$; CFA for normal female faces, $Mdn = 13.5$, and for composite female faces, $Mdn = 8.5$, $p = .05$. Apparently, symmetry is reached with fewer faces than is metrical averageness when faces are combined in composites.

Overall then, male composite faces were less attractive than normal male faces, whereas composite female faces were more attractive than normal female faces. In both sexes the composites were more symmetrical, but metrical averageness seemed to be present only for the 16-face composites in both sexes. However, it must be emphasized that the symmetry and averageness comparisons of normal versus composite faces are based on only 7 composite faces.

Asymmetry and Facial Attractiveness

We used parametric partial correlation analysis to assess the effects of facial averageness and facial asymmetry independently on the ratings of normal faces for each of the four adjectives. Mean ratings for each adjective on each face were used in the analysis. When facial averageness was partialed out of male ratings of normal female faces (Table 2), CFA and FA correlated significantly negatively with mean ratings of the faces for the adjectives *attractive* and *sexy*. The mean ratings of the female faces for the adjectives *dominant* and *healthy* also showed negative partial correlations with asymmetry (both CFA and FA), but these correlations did not reach statistical significance. Controlling averageness in the ratings of normal male photos by females resulted in significant negative partial correlations between CFA and mean ratings of *attractive, sexy* and *healthy*. FA in the normal male faces correlated significantly negatively with ratings of *attractive* and *healthy*, but not with *sexy* (Table 2). The zero-order correlations are also shown in Table 2. The similarity of the zero-order correlations and the partial correlations for female faces rated by men reveals that partialing out facial averageness has little effect on the magnitude of the relation between facial symmetry and the ratings of the face. However, partialing out averageness does seem to improve the relation for male faces rated by women.

Table 1
Ratings by Men and Women for Normal and Composite Faces

	Ratings of women's faces by men						Ratings of men's faces by women					
	Normal		Composite				Normal		Composite			
Characteristic	*M*	*SD*	*M*	*SD*	*t*(43)	*p*	*M*	*SD*	*M*	*SD*	*t*(53)	*p*
Attractive	2.79	0.80	3.26	1.00	3.59	.001	3.12	0.85	2.88	1.07	1.92	.060
Dominant	3.29	0.93	3.12	0.85	2.04	.048	3.48	0.88	3.02	0.99	5.23	.0001
Sexy	2.57	0.78	3.18	0.94	4.69	.0001	2.81	0.86	2.51	0.98	2.85	.006
Healthy	4.16	0.91	4.34	1.14	1.66	.103	4.68	0.84	4.42	0.99	3.17	.003

Note. Fifty-two women and 44 men rated 16 normal and 7 composite faces of each sex. Probabilities are two-tailed.

Averageness and Facial Attractiveness

When either CFA or FA was partialed out of the men's ratings of female faces, measured female facial averageness did not correlate significantly with the means of any of the ratings. A different result for averageness was seen for women's ratings of male faces when symmetry was controlled. In this case, statistically significant ($ps \leq .05$) negative partial correlations were found between facial averageness and *attractive* (CFAS, $r = -.45$; FAS, $r = -.49$), *dominant* (CFAS, $r = -.49$; FAS, $r = -.50$) and *sexy* (CFAS, $r = -.53$; FAS, $r = -.53$). In this analysis, averageness scores were multiplied by -1. Thus, the negative correlations mean that more average faces were less attractive. Both photometrical averageness (seen in composites) and metrical averageness seem to have a negative effect on the ratings of male faces by women.

Facial Features and Attractiveness

In order to find out which facial characteristics play a role in attractiveness ratings, we correlated the nine facial measures with the ratings of all pictures, that is, ratings of both normal and composite faces. Also, we partialed out FA and examined the relations between mean ratings of faces and the nine facial features, because FA may have had an effect on the judgments of the features. Zero-order correlations and partial correlations show similar patterns. For men's rating of female faces (Table 3), certain extremes in the eye region were rated as less attractive or sexy. Greater distance between outer eye corners was rated as significantly negatively attractive or sexy. The size of eyes showed the same pattern ($p = .06$). The distance between both outer and inner eye corners were negatively correlated with ratings of dominant. Cheekbone prominence showed a significant positive correlation with sexy.

A different pattern was seen for women's rating of male faces. Here extremes in the lower face were rated most favorably (Table 4). A large jaw and a wide mouth were rated as attractive. A large nose and a wide mouth were rated as healthy. Also, a broader face, in comparison with its length (lower face proportions), was attractive, sexy, healthy, and dominant. Cheekbone prominence was positively, but not significantly ($p = .11$), correlated with the male facial attractiveness ratings. As predicted, in male faces, certain extreme traits seem to play a role in attractiveness, especially the testosterone-facilitated traits that signal social dominance.

Discussion

Despite our small samples of 16 normal faces and 7 composites of each sex, we obtained some statistically significant relations, and, in general, the results were consistent with the hypotheses derived from the parasite theory of sexual selection. Before we discuss the results, we deal with our methods, some of which are different from the approaches that have been used traditionally in the study of facial features and attractiveness. Some of our methods may represent improvements.

Table 2
Zero-Order and Partial Correlations, With Metric Facial Averageness Controlled, Between Mean Ratings of Normal Faces and Central Facial Asymmetry (CFA) and Overall Facial Asymmetry (FA)

	Ratings of women's faces by men				Ratings of men's faces by women			
	CFA		FA		CFA		FA	
Characteristic	$r_o(14)$	$r_p(13)$	$r_o(14)$	$r_p(13)$	$r_o(14)$	$r_p(13)$	$r_o(14)$	$r_p(13)$
Attractive	−.55*	−.54*	−.54*	−.53*	−.56*	−.64*	−.48	−.60*
Dominant	−.26	−.26	−.41	−.41	.03	.07	.06	−.15
Sexy	−.51*	−.50*	−.49*	−.48*	−.38	−.51*	−.27	−.45
Healthy	−.21	−.21	−.18	−.19	−.45	−.53*	−.41	−.54*

Note. Fifty-two women and 44 men rated 16 normal faces of each sex. Probabilities are two-tailed.
* $p \leq .05$.

Table 3
Zero-Order and Partial Correlations Between Mean Ratings by Men of Women's Normal and Composite Faces and Facial Features

	Attractive		Dominant		Sexy		Healthy	
Characteristic	$r_o(21)$	$r_p(20)$	$r_o(21)$	$r_p(20)$	$r_o(21)$	$r_p(20)$	$r_o(21)$	$r_p(20)$
Distance between outer eye corners	−.32	−.44*	−.45*	−.49*	−.38	−.51*	−.10	−.12
Distance between inner eye corners	.01	.01	−.53*	−.55*	.04	.04	−.11	−.11
Mean eye size	−.30	−.42	−.07	−.09	−.37	−.49*	−.02	−.03
Nose width	−.02	.04	.10	.09	−.14	−.19	.32	.31
Cheek width	−.23	−.25	−.39	−.39	−.33	−.37	.15	−.14
Jaw width	−.07	−.07	.00	.00	−.12	−.14	.00	.00
Mouth width	−.17	−.01	−.07	.00	−.25	−.08	−.09	−.02
Cheekbone prominence	.45*	.25	.38	.38	.27	.48*	.14	.13
Lower face proportions	−.01	−.01	−.16	−.18	.06	.06	.02	.01

Note. Forty-four men rated 23 normal and composite women's faces. Partial correlations are controlled for asymmetry. Probabilities are two-tailed.
$* p \leq .05$.

It is customary to standardize facial size across faces by the full length of the face (chin to hairline; see Cunningham, 1986). This is problematic because of the subjectivity of defining the hair line in many facial photos. Our method involved making all faces equal in the vertical distance between the midline of eyes and the midline of mouth, and equal in the distance between pupils. Thus, the reference lines for standardization of face size can be determined objectively. It is possible, however, that our method introduces some unknown artifacts into the results.

For ratings of faces in our study, the rater was first presented with all faces in the set one at a time in a randomized order. In a second step, the rater rated the randomly ordered pictures. This eliminated order effects but may have influenced the mean ratings. Our mean ratings, however, were similar to those reported by Langlois and Roggman (1990).

We calculated facial asymmetry in two ways in an attempt to begin looking at whether people assess symmetry in the entire face or only by comparing adjacent parts. The results for the two measures of asymmetry were similar.

Female composite faces are more attractive than individual female faces, but individual male faces are rated more favorably than male composite faces. Our composite faces possessed more bilateral symmetry than individual faces, and our study reveals that both sexes view symmetry in opposite-sex individual faces as attractive. Why, then, are individual male faces more attractive to women than composite male faces? The answer apparently is that symmetry is not the only trait that affects facial attractiveness. Composite male faces were not statistically more average than individual male faces. We found that overall averageness of male facial features among individual male faces correlates negatively with attractiveness. Also, we found that certain male facial features are more attractive when large, especially those that probably are associated with displaying dominance and its correlates, such as parasite resistance, in

Table 4
Zero-Order and Partial Correlations Between Mean Ratings by Women of Men's Normal and Composite Faces and Facial Features

	Attractive		Dominant		Sexy		Healthy	
Characteristic	$r_o(21)$	$r_p(20)$	$r_o(21)$	$r_p(20)$	$r_o(21)$	$r_p(20)$	$r_o(21)$	$r_p(20)$
Distance between outer eye corners	.17	.11	−.02	.02	.23	.20	.16	.10
Distance between inner eye corners	<.01	−.07	−.15	−.10	.12	.08	−.01	−.06
Mean eye size	.23	.21	.08	.10	.23	.21	.22	.19
Nose width	.37	.34	.27	.31	.26	.24	.45	.44*
Cheek width	.21	.23	.07	.06	.19	.19	.17	.18
Jaw width	.45*	.47*	.28	.28	.32	.32	.31	.32
Mouth width	.45*	.47*	.12	.12	.31	.32	.43	.45*
Cheekbone prominence	.34	.34	.29	.29	.19	.19	.20	.20
Lower face proportions	−.46*	−.54*	−.42*	−.42*	−.41*	−.44*	−.43*	−.50*

Note. Fifty-two women rated 23 normal and composite men's faces. Partial correlations are controlled for asymmetry. Probabilities are two-tailed.
$* p \leq .05$.

human evolutionary history. A broad male jaw, which is a testosterone-facilitated feature, was attractive in our sample.

Other studies have also found that wide jaws in men are viewed as attractive to women (see Alley & Cunningham, 1991; Cunningham, Barbee, & Pike, 1990) and are viewed as a trait implying social dominance (Keating, 1985). Keating, Mazur, and Segall (1981) showed that men with big jaws are judged across many diverse cultures as socially dominant. Mazur, Mazur, and Keating (1984) showed that the rank ultimately attained by West Point cadets is predictable from the dominance rating of their facial photo.

Prominent cheekbones in women were viewed as sexy. The attractiveness of prominent cheekbones in women was shown by Cunningham (1986). It is unclear whether prominent cheekbones in women display immune system competence. The sexual dimorphism in cheekbone growth during puberty, for which men show much greater growth (Enlow, 1990), suggests that female cheekbones may signal information other than testosterone tolerance. Apparently, estrogens also handicap the immune system (see Thornhill & Gangestad, 1993; Wedekind, 1992). Highly estrogenized female facial features are attractive (Johnston & Franklin, in press). Perhaps cheekbone prominence in women reflects the effects of estrogen and thereby honestly advertises immunocompetence.

Our findings on female facial features show some inconsistency with certain previous studies. This is most clearly the case for female eye size (see Alley & Cunningham, 1991; Jones & Hill, 1993). Our results suggest that small, not large, eyes are more attractive and sexy in women. It is unclear at this time why we obtained this result, but it could reflect methodological variation between our study and other studies or a finding peculiar to our sample.

This is apparently the first study to indicate that measured facial symmetry affects positive judgments about facial attractiveness. FA showed a significant, negative relationship with facial attractiveness ratings in each of the sexes when the effect of facial averageness was removed statistically. The effect of facial symmetry on facial attractiveness may be fruitful to study in larger samples and other populations. There is increasing evidence that body symmetry plays a role in sexual selection in general in animal species (see Watson & Thornhill, 1994). In humans, nonfacial body symmetry was shown to correlate with facial attractiveness ratings (Gangestad, Thornhill, & Yeo, in press). Our study, coupled with Gangestad et al.'s study, suggests that facial attractiveness, facial symmetry, and body symmetry are intercorrelated. Thus, facial beauty may be a certification of high-quality development of the body in general. As we discuss in the introduction, a person's bilateral symmetry may reflect both high developmental quality and individual heterozygosity, both of which may have been important indicators of general health as well as parasite resistance in the environments of human evolutionary history. Preference of a symmetrical mate may have evolved because of positive genetic effects on offspring survival or because symmetrical individuals may be capable of greater parental investment on average.

Our study indicates that men may judge averageness of facial features in women as more attractive, but female facial symmetry appears to have a stronger influence than averageness on men's judgments. Composite female faces are more attractive and more symmetrical than individual female faces. Composite female faces seem to be more average than individual women's faces only when many faces are used. Also, when facial averageness was controlled in the partial correlation analysis, facial symmetry remained significant as a predictor of women's facial attractiveness rating. Removing facial symmetry, however, eliminated the significant relationship between facial averageness and ratings of attractiveness. The previous studies with composites that claimed that facial attractiveness is causally related to averageness of facial features did not control for facial symmetry (e.g., Langlois & Roggman, 1990).

The limited positive effect of facial averageness on the attractiveness of faces in our study must not be viewed as definitive. Our small sample of normal faces may have resulted in sampling error in the facial features of our subjects. Also, a large sample of faces may result in a different and more accurate population average than the population average in our study.

There is other evidence that both symmetry and averageness of certain facial features are important in the attractiveness of women's faces. Women use makeup to make certain features more average (e.g., interocular distance and nose size). Symmetry of features also is a major goal in making up the face. Consistent with our findings, women use makeup to make cheekbones appear larger, not average. These issues are discussed in each of the numerous makeup books that we examined (e.g., Gold, 1978; McCrerery, 1986). Also, reconstructive and plastic facial surgery is often used to correct asymmetries in the faces of both sexes (e.g., Whitaker & Pertschuk, 1982; Williamson & Varela, 1990). In future research, it will be important to evaluate the relative importance of averageness and symmetry in judgments of women's facial attractiveness. Manipulations of facial features in facial images may be a useful method. Clearly, nonaverageness in certain adult female facial features is maximally attractive. This is the case for chin size (smaller than average is more attractive) and lip size (larger than average is attractive; see Johnston & Franklin, in press). Johnston and Franklin pointed out that a small chin and large lips in women display high estrogen and thus a hormone profile of high female fertility. As we mention in the discussion of women's cheekbones, it is possible that highly estrogenized female facial features display immunocompetence.

Our approach attempts to understand why people make judgments of the sexual attractiveness of human faces and what facial features are involved in such judgments and why. Said differently, we wish to know what kind of Darwinian selection pressure led to the psychological adaptation that processes information about facial aesthetic value and generates the different feelings and motivations associated with viewing faces of different aesthetic value. We also wish to know what form of Darwinian sexual selection led to the evolution of the human facial features that affect facial attractiveness. Aestheticians commonly view beauty judgments as arbitrary (see review in Kovach, 1974). Although there is a hypothetical evolutionary mechanism that may have led to the evolution of mate choice on the basis of nonfunctional or arbitrary sexual attractiveness (Fisher, 1958), our results support the view that aesthetic judgments of faces are not capricious but instead reflect evolutionary functional assessments and valuations of potential mates (Thornhill & Gangestad, 1993). More specifically, these results are consistent at least with the hypothesis that judgments of facial aesthetics arise as outputs of psychological adaptation that is designed to assess a person's potential for health-related survival and reproduction in the environments of human evolutionary history and that this psychological adaptation generates the aesthetic experience of highly attractive or beautiful when it encounters facial features that are certifications of developmental homeostasis and of immunocompetence. Finally, these results suggest that sexual selection that favored developmentally healthy and immunocompetent persons designed certain features of the face that affect facial sexual attractiveness. Of course, more research is needed to assess the possible connection between infectious disease, immunocompetence, and human judgments of the beauty of human faces and other features of human bodily form.

Finally, we must mention that there is comparative evidence that human beauty judgments are tied importantly to assessing parasite effects. Gangestad and Buss (in press) showed that the importance that people across societies place on good looks in choice of a long-term mate correlates positively with the prevalence of parasites in the environment. The correlation is seen for both men and women.

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