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Do facial averageness and symmetry signal health?

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Abstract

We investigated whether the attractive facial traits of averageness and symmetry signal health, examining two aspects of signalling: whether these traits are perceived as healthy, and whether they provide accurate health information. In Study 1, we used morphing techniques to alter the averageness and symmetry of individual faces. Increases in both traits increased perceived health, and perceived health correlated negatively with rated distinctiveness (a converse measure of averageness) and positively with rated symmetry of the images. In Study 2, we examined whether these traits signal real, as well as perceived, health, in a sample of individuals for whom health scores, based on detailed medical records, were available. Perceived health correlated negatively with distinctiveness and asymmetry, replicating Study 1. Facial distinctiveness ratings of 17-year-olds were associated with poor childhood health in males, and poor current and adolescent health in females, although the last association was only marginally significant. Facial asymmetry of 17-year-olds was not associated with actual health. We discuss the implications of these results for a good genes account of facial preferences.

Keywords: Facial averageness; Facial symmetry; Health; Good genes theory of sexual selection

If beauty is in the eye of the beholder, as the saying goes, then perceptions of attractiveness will vary idiosyncratically from person to person. Recent evidence, however, indicates that standards of beauty are widely shared, even by people from very different cultures (Cunningham, Roberts, Wu, Barbee, & Druen, 1995; Langlois, et al., 2000; Zebrowitz, Montepare, & Lee, 1993) and by young infants (Kramer, Zebrowitz, San Giovanni, & Sherak, 1995;

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Langlois et al., 1987; Rubenstein, Kalakanis, & Langlois, 1999). Several theorists have proposed that these shared preferences for attractive facial traits are adaptations to the problem of mate choice (Andersson, 1994; Hamilton & Zuk, 1982; Miller & Todd, 1998; Møller & Swaddle, 1997; Thornhill & Gangestad, 1993, 1999). On this "good genes" view, attractive traits advertise aspects of mate quality.

Recently, psychologists have begun to investigate whether attractive faces signal mate quality, focussing on whether attractiveness signals health. Two meta-analyses have found a weak link between facial attractiveness and mental health (Feingold, 1992; Langlois et al., 2000). There was a slightly stronger link with physical health, but the authors caution that this was based on few studies and some dubious health measures (Langlois et al., 2000). The most comprehensive study, using lifetime health data for a large group of participants, failed to find any link between attractiveness and physical health (Kalick, Zebrowitz, Langlois, & Johnson, 1998). Overall, the evidence that facial attractiveness signals health is weak. However, global perceptions of attractiveness depend on our responses to many facial traits, only some of which are likely to be associated with mate quality. For example, traits that we find attractive because of our social and cultural histories are unlikely to signal mate value (for discussion of the many factors that contribute to attractiveness, see Zebrowitz & Rhodes, 2000). In the present study, we focus on two attractive facial traits that seem more likely to signal health: averageness and symmetry (for reviews that these are attractive traits, see Rhodes, Yoshikawa, Clark, Lee, McKay, & Akamatsu, in press; Thornhill & Gangestad, 1999).[1]

Genetic and environmental stresses during development produce small random deviations from bilateral symmetry, called fluctuating asymmetries, and deviations from average forms, in nonhuman animals (Møller & Swaddle, 1997; Parsons, 1990; Thornhill & Møller, 1997).[2] In humans, body symmetry is associated with health (Livshits & Kobyliansky, 1991; Scutt, Manning, Whitehouse, Leinster, & Massey, 1997; Thornhill & Møller, 1997; Waynforth, 1998), and fecundity (Manning, Scutt, Whitehouse, & Leinster, 1997; Møller, Soler, & Thornhill, 1995; Waynforth, 1998). Facial asymmetries and deviations from averageness occur in several chromosomal disorders (Hoyme, 1994; Thornhill & Møller, 1997). Facial averageness could also signal health, if stabilizing selection operates on facial traits, resulting in higher fitness for individuals with average traits (Koeslag, 1990; Symons, 1979), or if averageness is associated with parasite resistance (Gangestad & Buss, 1993; Thornhill & Gangestad, 1993).

We know of no studies that have examined the relationship between health and facial averageness in a normal human population. Two studies have examined the relationship between health and facial asymmetry. Grammer and Thornhill (1994) found that facial symmetry was perceived as a sign of health (at least in male faces), but no health data were available to determine whether those perceptions were accurate. Shackelford and Larsen (1997) reported a few significant negative correlations of facial asymmetry (measured) with psychological, emotional, and physiological health variables, but the effects did not replicate

[1] Averageness may not be optimally attractive (Perrett et al., 1998; Rhodes Hickford, & Jeffery, 2000), but averaged composites are still more attractive than most faces and their appeal must be explained.

[2] Although average traits signal health, not all extreme traits are signs of poor health. For example, extremes of sexually dimorphic traits, such as the peacock's tail, are thought to be honest indicators of health (Zahavi, 1975).

across their two samples and the large number of correlations reported (over 1000) raises the possibility of Type I statistical errors. Other limitations were the use of self-reported health symptoms over a short period, small samples, and failure to find the usual correlation between symmetry and attractiveness in these samples.

Here, we investigated whether facial averageness (and its converse, distinctiveness) and facial symmetry signal health. We examined two aspects of signalling: whether these traits are perceived as healthy and whether they provide accurate information about health. In Study 1, we manipulated the averageness and symmetry of individual faces using morphing techniques and examined the effects on perceived health. We also examined whether perceived health correlated with rated distinctiveness (a converse measure of averageness) and symmetry of the images. In Study 2, we examined the relationships of facial distinctiveness and asymmetry with both perceived and actual health, using health scores based on detailed medical records (from the database used by Kalick et al., 1998). The participants were born in the 1920s, and grew up before vaccinations and antibiotics were readily available. They experienced a variety of infectious conditions, and their health scores could plausibly tap genotypic diversity in pathogen resistance.

1. Study 1

Raters judged the health of a set of young adult faces in which averageness and symmetry were manipulated using morphing procedures (see Fig. 1). These images had been used in a previous study, where averageness and symmetry were shown to independently affect attractiveness (Rhodes, Sumich, & Byatt, 1999). We hypothesized that more average and more symmetric versions would look healthier than less average and less symmetric versions of these faces, and that averaged composite faces would look healthier than most individual faces. We also expected that health ratings would correlate positively with ratings of symmetry, and negatively with ratings of distinctiveness (Rhodes et al., 1999). Symmetry ratings change systematically with experimental manipulations of symmetry, confirming their validity as an index of symmetry (e.g., Rhodes, Proffitt, Grady, & Sumich, 1998). Distinctiveness ratings are a useful converse measure of averageness. They change systematically with experimental manipulations of averageness (Lee, Byatt, & Rhodes, 2000; Rhodes, Carey, Byatt, & Proffitt, 1998; Rhodes et al., 1999; Rhodes & Tremewan, 1996), and more distinctive faces differ more from an average configuration than do less distinctive faces (e.g., Bruce, Burton, & Dench, 1994; Bruce, Coombes, & Richards, 1993; Johnston & Ellis, 1995). Finally, we examined whether distinctiveness and asymmetry (reverse-scored symmetry ratings) are correlated in the undistorted faces, as expected if these traits reflect developmental instability (Møller & Swaddle, 1997).

1.1. Method

1.1.1. Participants

A total of 12 male and 12 female adults from the University of Western Australia received either $5 or course credit for participating.

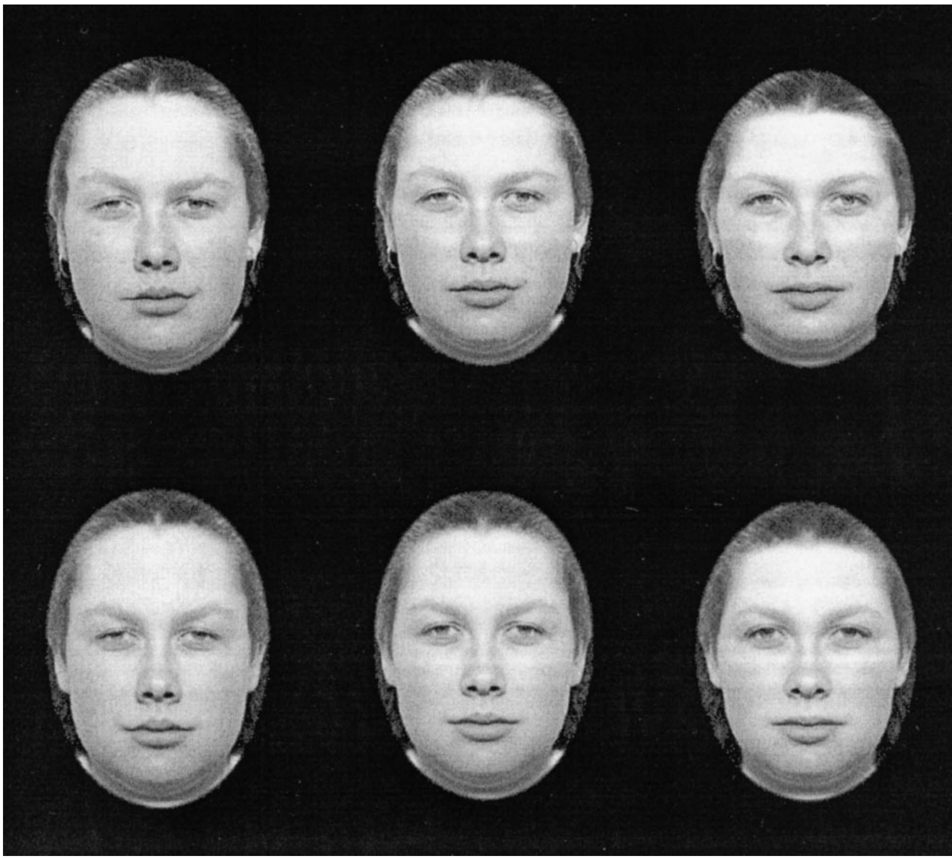

Fig. 1. Top row: Low (left), normal (center), and high (right) averageness versions of a face. Bottom row: Perfectly symmetric versions of each top row image.

1.1.2. Stimuli

The images were taken from Rhodes et al. (1999), where full details of their construction can be found. Briefly, standard morphing procedures were applied to 48 (24 males) black and white, front-view photographs (12.5×10 cm) of young adults with neutral expressions, to create averaged composites of male and female faces, high and low averageness versions of each individual face, and perfectly symmetric versions of all the images. This resulted in a total of 292 images (48 faces $\times$ 3 averageness $\times$ 2 symmetry levels plus normal and symmetric versions of the male and female averaged composites).

An averaged composite for each sex was made by blending all 24 same-sex faces using Gryphon's Morph™. The program creates an average configuration by calculating the mean location for each of 120 landmark points, warping each same-sex face into this average configuration, and then averaging (across faces) the grey-level values in corresponding pixels. High and low averageness versions of each face were created in Morph™ by warping (using the landmark points) the shape of each face closer to (high) or further from (low) the shape of the same-sex average (Fig. 1, top row). The high averageness version reduced all spatial differences between the face and the same-sex average by 50%, and the low averageness version exaggerated these differences by 50%. Perfectly symmetric versions of each image were created by blending each image with its mirror image, using the same procedure as for making averaged composites. These morphing procedures are widely used in studies of facial attractiveness and face perception (e.g., Perrett et al., 1998, 1999; Rhodes Proffitt, Grady, & Sumich, 1998; Rhodes, Hickford, & Jeffery, 2000; Rhodes et al., 1999). All images were displayed in black oval masks, which hid most of the hair, but displayed the face outline, chin, and inner hairline.

1.1.3. Procedure

Each subject rated all 292 images on a seven-point scale of healthiness (1 = *not healthy*, 7 = *very healthy*). The images were presented in six blocks. One version of each face was assigned to one block, with equal numbers of each sex and version of face in each block. The four averaged composites were added to block one (not necessarily the first block seen). The blocks were presented in six different orders (123456, 234561, etc.), counterbalanced with sex of subject. Images were randomized within blocks.

1.2. Results and discussion

1.2.1. Experimental manipulations of averageness and symmetry

A four-way ANOVA was carried out on mean health ratings, with sex of subject as a between-subjects factor, and sex of face, averageness level (low, normal, high, composite), and symmetry level (normal, perfect) as repeated measures factors. Planned pairwise comparisons were used to test for predicted increases in health ratings as averageness levels increased from low to normal (unmanipulated), normal to high, and high to composite.

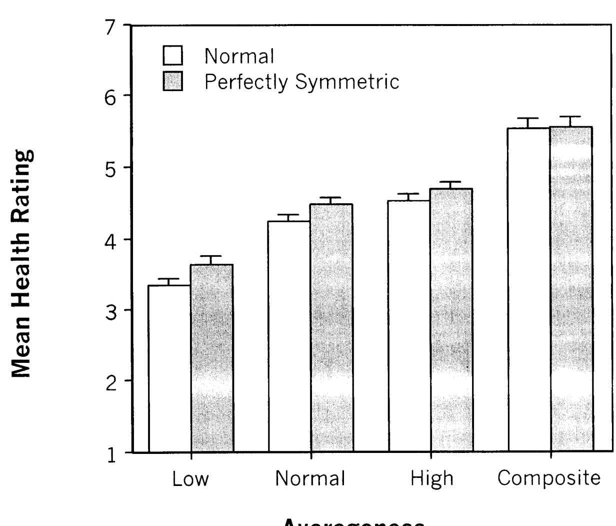

Fig. 2. Mean health ratings as a function of experimentally manipulated averageness and symmetry levels in Experiment 1. S.E. bars are shown.

As expected, health ratings increased with both averageness and symmetry level (Fig. 2), with significant main effects of averageness, $F(3,66) = 78.13$, $P < .0001$ ($M = 3.5$, S.E. = 0.1, low; $M = 4.4$, S.E. = 0.1, normal; $M = 4.6$, S.E. = 0.1, high; $M = 5.6$, S.E. = 0.1, composite) and symmetry level, $F(1,22) = 27.96$, $P < .0001$ ($M = 4.4$, S.E. = 0.1, normal; $M = 4.6$, S.E. = 0.1, perfect). These factors interacted, $F(3,66) = 3.48$, $P < .03$ (Fig. 2), but simple tests of main effects showed significant effects of averageness at both symmetry levels, both $F(3,66)$'s > 68.15, P's < .0001. At both levels, health ratings increased from low-averageness to normal (unmanipulated) images, from normal to high-averageness images, and from high-averageness to averaged composite images, as predicted, planned comparisons, all P's < .01. The impact of reducing averageness on perceived health appeared larger (M's = 3.5 vs. 4.4) than that of increasing averageness (M's = 4.4 vs. 4.6), suggesting that we may be particularly sensitive to signs of poor health. We note, however, that the increase from high-averageness images to averaged composites (M's = 4.6 vs. 5.6) was comparable to that from low to normal averageness. Simple main effects of symmetry level were significant for all averageness levels, $F(1,22)$'s > 8.52, P's < .008, except for averaged composites, which are almost perfectly symmetric anyway (Rhodes et al., 1999), $F < 1$. Male faces were rated as healthier ($M = 4.7$, S.E. = 0.1) than female faces ($M = 4.3$, S.E. = 0.1), $F(1,22) = 36.29$, $P < .0001$.

We also conducted a four-way ANOVA with faces as the random factor. Sex of face was a between faces factor, and sex of rater, averageness level (low, normal, and high)[3] and symmetry level (normal, perfect) were within-face factors. There were significant effects of both symmetry ($M = 4.0$, S.E. = 0.1, normal; $M = 4.3$, S.E. = 0.1, perfect), $F(1,46) = 74.02$, $P < .0001$, and averageness levels, $F(2,92) = 245.81$, $P < .0001$ ($M = 3.5$, S.E. = 0.1, low; $M = 4.3$, S.E. = 0.1, normal; $M = 4.6$, S.E. = 0.1, high), indicating that these effects generalized across faces. Symmetry also interacted with sex of rater, $F(1,46) = 6.89$, $P < .02$, but both sexes rated perfectly symmetric faces as healthier than normal faces (male raters: $M = 3.9$, S.E. = 0.1; normal; $M = 4.2$, S.E. = 0.1; perfect; female raters: $M = 4.1$, S.E. = 0.1; normal; $M = 4.3$, S.E. = 0.1; perfect), both t's > 6.88, P's < .0001. The only other significant effects were sex of face, $F(1,46) = 6.83$, $P < .02$ ($M = 4.4$, male; $M = 3.9$, female; both S.E. = 0.1) and sex of rater, $F(1,46) = 10.03$, $P < .003$ ($M = 4.1$, male; $M = 4.2$, female; both S.E. = 0.1).

1.2.2. Health ratings for averaged composite faces

The averaged composite faces and their symmetric versions received high health ratings (averaging across raters), as expected. The male averaged composite and its symmetric version received higher health ratings than any other male image (both M's = 5.8). The female averaged composite and its symmetric version received higher health ratings (both M's = 5.3) than all but 11 female images. The top rating of 5.8 went to a symmetric, high-average female image. These results provide further evidence that averageness and symmetry look healthy.

1.2.3. Correlating health ratings with distinctiveness and symmetry ratings

Distinctiveness and symmetry ratings were taken from Rhodes et al. (1999), where each variable was rated on a seven-point scale by a different group of 36 raters. Distinctiveness

[3] Composite cannot be included as a level of the averageness factor, because it does not vary across faces.

Table 1
Pearson product–moment correlations of perceived health with each of rated distinctiveness (a converse measure of averageness) and rated symmetry in Study 1

		Perceived health and distinctiveness		Perceived health and symmetry	
Faces	*n*	Zero-order	Partial	Zero-order	Partial
All versions					
Both sexes	292	− .66****	− .61****	.39****	.25****
Female	146	− .63****	− .59****	.39****	.29****
Male	146	− .79****	− .76****	.47****	.33****
Undistorted					
Both sexes	48	− .36**	− .27*	.38***	.29**
Female	24	− .34*	− .36*	.40**	.42**
Male	24	− .52***	− .22	.59***	.42**

Partial correlations control for the other variable (rated symmetry or rated distinctiveness).
* $P<.10$.
** $P<.05$.
*** $P<.01$.
**** $P<.001$.

was explained as the ease with which a face could be picked out of a crowd (1 = *not distinctive*, 7 = *distinctive*) (Valentine, 1991). Health ratings were obtained in the present experiment. All ratings were highly reliable (Cronbach α's over .92). Perceived health was significantly negatively correlated with distinctiveness, and significantly positively correlated with symmetry, as predicted (Table 1). These correlations remained significant when the effect of the other variable (distinctiveness or symmetry) was partialled out, indicating that both variables independently contributed to perceptions of health. A similar pattern was obtained for the undistorted faces, although not all effects reached significance with the reduced range on both variables and smaller sample sizes (Table 1). Reliability of the ratings for the undistorted faces was moderately high (Cronbach α's over .83).

1.2.4. Correlating distinctiveness and asymmetry for undistorted faces

Distinctiveness and asymmetry (reverse-scored symmetry ratings) were significantly correlated, $r = .35$, $n = 48$, $P < .02$, consistent with the claim that both traits reflect developmental instability (Møller & Swaddle, 1997).

2. Study 1a

The perfectly symmetric images used in Study 1 were created by blending each image with its mirror image (after removing blemishes), which results in smooth skin tones, as well as perfect symmetry. To ensure that the healthy appearance of these images was due to their symmetry and not their smooth complexions, we created new images with the smooth skin tones of the perfectly symmetric images, but the same degree of asymmetry as the original faces. These new images were created by warping each perfectly symmetric image into its original, somewhat asymmetric shape.

Twenty-four participants (12 males) rated the health of the original, undistorted faces, their perfectly symmetric versions, and the smooth-skinned asymmetric images, presented in random order. There was a significant effect of image type, $F(2,46) = 36.01$, $P < .0001$, with perfectly symmetric images rated highest ($M = 4.3$, S.E. = 0.1), and the new smooth-skinned, asymmetric images ($M = 3.7$, S.E. = 0.1) rated lowest, with the original faces in between ($M = 4.0$, S.E. = 0.1). This result shows that the healthy appearance of the perfectly symmetric faces is not due solely to their smooth complexions (see Rhodes, Proffitt, Grady, & Sumich, 1998, for additional evidence that the attractiveness of these symmetric images is not an artifact of the blending process used to create them).

3. Study 2

We investigated whether facial distinctiveness and asymmetry are related to real, as well as perceived, health in a sample for which health scores, based on detailed medical records, were available. If distinctiveness and asymmetry reflect developmental instability, as hypothesized, then they should each correlate negatively with prior and current health. We also examined whether these traits predict future health, as would be expected if an individual's resistance to disease, parasites, and other stressors is stable over time. Any trait that correlates with past, present, or future health would provide useful information about mate quality.

Facial distinctiveness was assessed using ratings. Facial asymmetry was assessed by both measurements and ratings.[4] We used Grammer and Thornhill's (1994) measurement method, which captures asymmetries in position of the eyes, nose, mouth, cheekbones, and jaw. The ratings may also be influenced by asymmetries in the complexion, fat distribution, size of bilateral features (e.g., eyes and ears), and overall face shape.

3.1. Method

3.1.1. Participants and procedures

Participants were obtained from the Intergenerational Studies archive (Clausen, 1993), held at the University of California, Berkeley, Institute of Human Development (IHD), as in Kalick et al.'s study (1998). They were born between 1920 and 1929 in Berkeley and Oakland, CA, and almost all were from Caucasian, working- and middle-class families.

Black and white full-face photographs (approximately 7.5 × 11.3 cm) of 316 (161 females, 155 males) individuals in late adolescence (17 years) were obtained from the archive and digitized. Most displayed neutral expressions. Health ratings (on a five-point scale) for these individuals, based on detailed medical examinations and assessment of health history by IHD physicians, were also obtained from the archive. Composite health scores for childhood and adolescence, respectively, were obtained by averaging annual

[4] Participants actually rated symmetry, but these were reverse-scored to give asymmetry scores. This was done to simplify the exposition and facilitate comparison with asymmetry measurements.

health ratings for ages 3 to 10 and 11 to 18. These scores were based largely on the frequency, duration, and severity of infectious conditions, such as colds, measles, rubella, and respiratory infections (Bayer & Snyder, 1950; Bayer, Whissell-Beuchy, & Honzik, 1981). Midadult health scores were obtained by averaging the ratings of two independent IHD judges, based on a single medical examination and history taken between ages 30 and 36 (supplemented by laboratory tests for about a third of the participants). Adolescent health scores (range = 1.5–5.0, S.D. = 0.6) were available for all 316 participants (161 females, 155 males). Scores for childhood (range = 1.6–4.9, S.D. = 0.5), current (range = 1.0–5.0, S.D. = 0.9), and midadult health (range = 1.0–5.0, S.D. = 0.9) were available for 169 (91 females, 78 males), 281 (151 females, 130 males), and 253 (129 females, 124 males) participants, respectively.

Forty-eight young adult university students (24 males) received course credit for rating digitized versions of the faces on seven-point scales of either symmetry (1 = *low*, 7 = *high*) (n = 24, 12 males) or distinctiveness (1 = *low*, 7 = *high*) (n = 24, 12 males). Faces were blocked by sex and order of sex was counterbalanced across participants. Eight sample faces, chosen to illustrate the range of the dimension to be rated, were shown at the beginning of each block. Raters were encouraged to use the full range of the scale. Attractiveness and perceived health ratings were taken from Zebrowitz, Olson, and Hoffman (1993) and Kalick et al. (1998), respectively, for use in the regression analyses (some missing data). Interrater agreement was good for all four ratings. Cronbach α reliabilities, calculated separately for male and female faces, ranged from .79 to .91 (M = 0.85, S.D. = 0.03). As in previous studies, ratings were averaged across raters to obtain a mean rating for each face on each scale (cf., Kalick et al., 1998). Mean distinctiveness and asymmetry ratings ranged from 2.5 to 5.8 (S.D. = 0.7) and from 1.8 to 6.4 (S.D. = 0.7), respectively. SES was measured using the Hollingshead index (Hollingshead & Redlich, 1958). It was controlled in all analyses because it correlates with health (Adler et al., 1994).

We also measured asymmetry directly for faces in good front-view poses (88 females, 106 males), as judged by two independent raters. Images were standardized so that pupils were 80 pixels apart and horizontally aligned, and NIH's Image 1.62 was used to locate points on the faces and record their locations. We used Grammer and Thornhill's (1994) method to measure asymmetry. Corresponding feature locations are found on the two sides of the face and joined by horizontal lines. The midpoints of these lines are vertically aligned in a perfectly symmetric face, and their summed offsets (number of pixels) from the mean midpoint provides a measure of facial asymmetry. Six pairs of points were found and joined to create six horizontal lines between the following pairs of points (first and second points on left and right sides of face, respectively): the outermost eye corners (P1, P2), the innermost eye corners (P3, P4), the left and right cheekbones (defined as x coordinates of the widest points of face below the eyes)[5] (P5, P6), the widest points of nose (P7, P8), the sides of the face directly out from lip corners (P9, P10), to the outermost lip corners (P11, P12). The midpoints of these lines were calculated and the offset of each midpoint from the mean of all six

[5] Grammer and Thornhill (1994) used the widest points of the face on a horizontal line below the eyes. Our measure can capture asymmetries in cheekbone width when widest points are at different heights.

midpoints was summed for use as our measure of asymmetry (range = 2.6–25.5, S.D. = 3.6). All measurements were made by two independent raters. Reliability was good, $r = .78$, $n = 194$, $P < .0001$. The asymmetry measurements correlated significantly with asymmetry ratings, but the correlation was quite small, $r = .26$, $n = 194$, $P < .0001$, all faces ($r = .20$, $n = 88$, $P < .06$, female faces; $r = .33$, $n = 106$, $P < .001$, male faces).

3.2. Results and discussion

3.2.1. Are low levels of distinctiveness and asymmetry attractive?

We began by confirming that distinctiveness and asymmetry (reverse-scored symmetry ratings) were significantly negatively correlated with attractiveness in this sample (Table 2). These effects remained when the other variable (and SES) were controlled, indicating that low levels of distinctiveness and asymmetry contribute independently to attractiveness and replicating Rhodes et al. (1999).

Unlike rated asymmetry, measured asymmetry did not show a consistent association with attractiveness. Others have also failed to find a clear association between measured facial asymmetry and attractiveness (Jones & Hill, 1993; Shackelford & Larsen, 1997), and to our knowledge, only Grammer and Thornhill (1994) have found a significant association. Given the strong evidence that facial symmetry is attractive (Mealey, Bridgestock, & Townsend, 1999; Perrett et al., 1998; Rhodes et al., 1998), failure to find an association between attractiveness and measured asymmetry raises doubts about the validity of the measurements. Future studies should examine whether measured asymmetry changes with experimental manipulations of symmetry, as do ratings of asymmetry.

Table 2
Pearson product–moment correlations of attractiveness with rated distinctiveness, rated asymmetry (reverse-scored symmetry ratings), and measured asymmetry in Study 2

Variables	Sex of face	n[a]	Zero-order	Partial
Distinctiveness	All	314	− .34****	− .31****
	Female	161	− .29****	− .26****
	Male	153	− .36****	− .32****
Rated asymmetry	All	314	− .25****	− .20****
	Female	161	− .24***	− .20 **
	Male	153	− .27****	− .21 **
Measured asymmetry	All	192	.11	.12
	Female	88	.22 **	.19*
	Male	104	.06	.13

Partial correlations control for the effect of the other variable (rated distinctiveness or asymmetry) and adolescent SES.

[a] SES scores were missing for two males, so male n's are reduced by two. These males were excluded from the zero-order, as well as partial, correlations, so that both correlations would be for the same sample.

* $P < .10$.

** $P < .05$.

*** $P < .01$.

**** $P < .001$.

3.2.2. Are distinctiveness and asymmetry perceived as unhealthy?

Perceived health was significantly negatively correlated with both distinctiveness and asymmetry (Table 3). These effects remained when the effect of the other variable (and SES) was controlled, indicating that distinctiveness and asymmetry were independently perceived as signs of poor health. Measured asymmetry did not, however, correlate with perceived health.

3.2.3. Are distinctiveness and asymmetry really unhealthy?

Kalick et al. (1998) found that overall attractiveness was unrelated to health in an almost identical sample. Here, we examined whether the attractive traits of averageness and symmetry are related to health, by examining the relationships between each of rated distinctiveness, rated asymmetry, and measured asymmetry at age 17 and the following measures of health: a composite measure of childhood health, a composite measure of adolescent health, health at 17 (i.e., current health), and midadult health (Table 4). In each case, we also partialled out the effects of the other variable and adolescent SES.

Facial distinctiveness at 17 appeared to provide some information about health. For males, it reflected childhood health, and for females, it reflected current health and (marginally) adolescent health. The correlations were modest in size, but they offer some support for the hypothesis that low levels of facial distinctiveness are associated with good health. The sex difference was unexpected, and future research will be needed to determine whether it is genuine. The ranges of both health and distinctiveness scores were similar for males and females, so sex differences in the range of these variables are unlikely to account for it.

Table 3
Pearson product–moment correlations of perceived health with rated distinctiveness, rated asymmetry (reverse-scored symmetry ratings), and measured asymmetry in Study 2

Variables	Sex of face	*n*	Zero-order	Partial
Distinctiveness	All	244	− .43****	− .40****
	Female	121	− .54****	− .51****
	Male	123	− .30****	− .26***
Rated asymmetry	All	244	− .31****	− .26****
	Female	121	− .28***	− .22 **
	Male	123	− .35****	− .30****
Measured asymmetry	All	151	− .07	− .06
	Female	69	− .05	− .13
	Male	82	− .09	− .02

Partial correlations control for the effect of the other variable (rated asymmetry or rated distinctiveness) and adolescent SES. Perceived health ratings were not available for all the faces for which we had asymmetry measurements, hence, the reduced *n*'s.

* $P<.10$.

** $P<.05$.

*** $P<.01$.

**** $P<.001$.

Table 4
Predicting health from distinctiveness and asymmetry at 17

	Childhood health			Adolescent health			Current health			Midadult health		
Variables (at age 17)	*n*	Zero-order	Partial	*n*	Zero-order	Partial	*n*	Zero-order	Partial	*n*	Zero-order	Partial
Distinctiveness												
All	169	– .07	– .05	314	– .10*	– .10*	281	– .19****	– .19***	253	– .05	– .05
Female	91	.06	.09	161	– .14*	– .15*	151	– .25***	– .24***	129	– .06	– .04
Male	78	– .28 **	– .28 **	153	– .04	– .04	130	– .08	– .08	124	– .05	– .05
Rated asymmetry												
All	169	.03	.04	314	.01	.03	281	.01	.05	253	.01	.02
Female	91	.05	.03	161	.01	.04	151	– .02	.03	129	– .03	– .03
Male	78	.01	.03	153	.00	.01	130	.03	.05	124	.05	.06
Measured asymmetry												
All	102	.03	.02	192	– .06	– .07	170	.00	.01	153	– .12	– .10
Female	53	.14	.14	88	– .04	– .06	84	– .08	– .12	70	– .20*	– .23*
Male	49	– .10	– .18	104	– .07	– .05	86	.10	.14	83	– .04	– .01

Pearson product–moment correlations of each of rated distinctiveness, rated asymmetry, and measured asymmetry at age 17, with various measures of health. Partial correlations control for the other variable (rated asymmetry or distinctiveness) and adolescent SES.

* $P<.10$.

** $P<.05$.

*** $P<.01$.

**** $P<.001$.

Facial asymmetry showed little association with health. Neither rated nor measured asymmetry correlated with any of the health measures, apart from a marginal correlation between midadult health and measured facial asymmetry at 17 in females. This result should be interpreted with caution, however, given the small sample size and the absence of other correlations between asymmetry and health.

3.2.4. Correlating distinctiveness and asymmetry

There was a significant, albeit small, correlation between rated distinctiveness and rated asymmetry, $r=.20$, $n=316$, $P<.0001$, all faces ($r=.20$, $n=161$, $P<.02$, female faces; $r=.21$, $n=155$, $P<.008$, male faces), as expected if both reflect developmental instability. Measured asymmetry did not correlate with distinctiveness, $r=-.02$, $n=194$, ns, all faces ($r=-.14$, $n=88$, ns, female faces; $r=.07$, $n=106$, ns, male faces).

4. General discussion

The attractive facial traits of averageness and symmetry were both perceived as healthy. We also found modest evidence that averageness signalled real health. Specifically, facial distinctiveness at 17, a prime age for mate choice, was associated with poor childhood health in males and poor current and adolescent health in females, although the last relationship was only marginally significant. Marked deviations from facial averageness are diagnostic of some chromosomal disorders (for a review see Thornhill & Møller, 1997) and our results suggest that more subtle deviations may also provide cues to the health of potential mates. A preference for average faces could, therefore, have evolved because it enhanced reproductive success, either because healthy mates provide better parental care or because they confer genetic benefits on their offspring if disease resistance is heritable, or both. Healthy individuals are also less likely to pass on infectious illnesses, so a preference for traits that signal health could also be useful beyond the context of mate choice.

Although symmetry reflects developmental stability and health in many species (for a review see Møller & Swaddle, 1997), we found little association between human facial symmetry and either past, present, or future health. There was a marginally significant correlation between measured facial asymmetry at 17 and midadult health in females, but this could be a Type I statistical error. Failure to find a clear link between health and measured asymmetry could indicate some problem with the asymmetry measurements (that capture only a limited set of asymmetries in the internal features, cheekbones, and jaw, and that are very sensitive to deviations from perfect front-views), but that would not explain why health did not correlate with symmetry ratings.

Waynforth (1998) has found that fluctuating asymmetry (FA) of body traits was associated with poor health in a population with limited access to health care, and it is possible that facial asymmetry would signal poor health in such a population, or in ancestral populations (Daly & Wilson, 1999). We note, however, that our participants grew up before the use of vaccinations and antibiotics, and that their access to health care did not prevent an association between health and facial distinctiveness.

Existing studies of facial asymmetry and health have not isolated FA from other forms of asymmetry (e.g., directional asymmetry, DA), which may not reflect developmental stability. Different results might, therefore, be obtained if facial FA was isolated. We note, however, that when faces are averaged together, reducing FA but not DA, the resulting composite is very symmetric (Rhodes et al., 1999). This indicates that faces have very limited directional asymmetry, in which case isolating FA would be unlikely to give different results from the present study.

The link between facial averageness and health found here provides modest support for a good genes account of why average faces are attractive. However, recent evidence that averageness is attractive for stimuli unrelated to mate choice, such as dogs, birds, and wristwatches (Halberstadt & Rhodes, 2000), suggests that a preference for average faces may not have evolved solely as an adaptation for identifying good mates. Rather, some quite general perceptual or cognitive mechanisms, such as a tendency to abstract prototypes or to favor familiar stimuli, may also contribute to our preference for average faces (Halberstadt & Rhodes, 2000; Langlois & Roggman, 1990; Rubenstein et al., 1999).

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