

# Physical Attractiveness and Health in Western Societies: A Review

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Evidence from developed Western societies is reviewed for the claims that (a) physical attractiveness judgments are substantially based on body size and shape, symmetry, sex-typical hormonal markers, and other specific cues and (b) physical attractiveness and these cues substantially predict health. Among the cues that the authors review, only female waist-to-hip ratio and weight appear to predict both attractiveness and health in the claimed manner. Other posited cues—symmetry and sex-typical hormonal markers among them—failed to predict either attractiveness or health (or both) in either sex. The authors find that there is some indication that attractiveness has an overall relationship with health among women, but little indication that male attractiveness relates to male health.

*Keywords:* attractiveness, health, evolution

The theory that human physical attractiveness judgments are in part driven by correlates of health has become widely accepted by evolutionary researchers and is influential in other circles as well. Early in the 20th century, Westermarck (1921) and Ellis (1926) were among the theory's defenders, and its current form began with Symons (1979), who argued at length that sexual attractiveness is based in part on reproductive value and its correlates, including health and female age (see also Buss, 1994; Symons, 1995). The revived theory initially generated little empirical research. Since the early 1990s, however, research into the health correlates of attractiveness has exploded, centered on a small number of subtle predictors of attractiveness—primarily waist-to-hip ratio (WHR), symmetry, and sex-specific hormonal markers.

One often sees attractiveness–health links in the context of “good genes” sexual selection theory (Grammer, Fink, Moller, & Thornhill, 2003; Miller & Todd, 1998), which begins with the notions that people vary in their health in ways that are partly heritable, that health is central to genetic propagation, and therefore that preferentially mating with people with genes that lead to health should enhance one's fitness. Good-genes theory posits that human judgments of physical attractiveness, particularly in mating contexts, have evolved to respond in part to heritable cues associated with health. But attractiveness–health links might derive from more than just heritable genetic quality. Most obviously, good-gene theorists typically include age-based cues in their predictor sets, in particular for women, and such cues relate to health independently of normal variations in genetic quality. Other benefits may exist as well—for example, a healthier mate could be expected to provide more future resources and protection than a less healthy one.

## Relationships Posited in the Attractiveness–Health Literature

In this section we identify the primary attractiveness–health links that we review in this article. Later we address a number of potential qualifications for these relationships, including quite general qualifications (see *Evolutionary Expectations for Attractiveness–Health Links in Developed Societies and in General*).

The structure of the most widely discussed hypotheses in the attractiveness–health literature is that judgments of physical attractiveness should be based on a set of identifiable cues associated with health and the result should be that physical attractiveness itself is associated with health. In the past decade, research into attractiveness–health links has been dominated by the search for cues on which physical attractiveness judgments might be based. Less work has been done to test the central claim that these cues and attractiveness itself predict health outcomes. The cues that have received the most attention include symmetry in both faces and bodies; sexually dimorphic face characteristics; body size and shape, including WHR, body mass index (BMI), and other measures; and face averageness. Other proposed cues exist as well, including hair quality, skin quality, skin coloration, eye brightness/clarity, and so forth, though less work has been done to investigate them and we do not review them here.

It is hypothesized that each of these categories of cues signals something about the bearer's health (for reviews, see Grammer et al., 2003; Miller & Todd, 1998; Thornhill & Gangestad, 1996, 1999; Thornhill & Moller, 1997). Symmetry (in particular, fluctuating asymmetry [FA], which we describe in more detail below) is thought to reflect the stability of one's developmental course, indicating the extent to which one's genes were successful in building a symmetric organism despite environmental insults and attacks from pathogens. Sex-specific hormones are thought to suppress immune functioning in both sexes, meaning that those individuals with high sex-specific hormone loads must have particularly good immune systems. For women particularly, appropriate estrogen levels are thought to be critical to reproductive

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health. Both obesity and extreme thinness are thought to negatively affect health in both sexes.

### Claims That Attractiveness–Health Links Exist in Developed Western Societies

It is important to give some recent examples of the kinds of claims that we review. A recent review by Grammer et al. (2003) provides several clear examples.

Current theoretical and empirical findings suggest that mate preferences are mainly cued on visual, vocal and chemical cues that reveal health including developmental health. (p. 385)

Any book on the use of cosmetics is a manual of how to accentuate the features that are known to be reliable health and fertility indicators: oestrogenized faces, and symmetric facial features. (p. 388)

Considerable evidence has accumulated in recent years supporting the hypothesis that both facial and bodily physical attractiveness are health certifications and thus represent honest signals of phenotypic and genetic quality. (p. 399)

The basic features of human beauty in faces and bodies are symmetry, averageness, and sex-hormone markers. These features reflect sex-prototypical design of traits, developmental stability and immunohandicaps and are linked directly to optimal reproduction. (p. 402)

Of course, the Grammer et al. (2003) review makes additional points, some of which give further nuance to these claims. But its component claims have been made many times, including the following recent examples.

Body symmetry predicts attractiveness (Brown & Moore, 2003; Fink, Manning, Neave, & Grammer, 2004; Geary, Vigil, & Byrd-Craven, 2004; Henderson & Anglin, 2003; Sarwer, Grossbart, & Didie, 2003).

Body symmetry predicts health (Al-Eisa, Egan, & Wassersug, 2004; Brown & Moore, 2003; Grammer et al., 2003; Sarwer et al., 2003; Singh, 2004).

Low WHR predicts both body attractiveness and health (including reproductive health) in women (Fan, Liu, Wu, & Dai, 2004; Geary et al., 2004; Sarwer et al., 2003; Singh, 2004; Streeter & McBurney, 2003).

Wide shoulders and low fatness predict body attractiveness in men (Dixson, Halliwell, East, Wignarajah, & Anderson, 2003; Grammer et al., 2003).

Tallness predicts attractiveness (Nettle, 2002a, 2002b) and good health (Mueller & Mazur, 2001; Pawlowski & Koziel, 2002) in men.

Face symmetry predicts attractiveness (Fink et al., 2004; Geary et al., 2004; Koehler, Simmons, Rhodes, & Peters, 2004; Little & Jones, 2003; Simmons, Rhodes, Peters, & Koehler, 2004).

Face symmetry predicts health (Brown & Moore, 2003; Grammer et al., 2003; Sarwer et al., 2003; Singh, 2004; Soler et al., 2003).

Face averageness predicts face attractiveness (Grammer et al., 2003; Henderson & Anglin, 2003; Koehler, Rhodes, & Simmons, 2002; Sarwer et al., 2003; Simmons et al., 2004).

Sex-typical hormonal markers predict face attractiveness (Grammer et al., 2003; Henderson & Anglin, 2003; Koehler et al., 2004; Miller & Todd, 1998; Simmons et al., 2004).

Sex-typical hormonal markers predict health (Grammer et al., 2003; Miller & Todd, 1998).

The claims listed above are claims about what researchers already know to be true, and they are stated in quite general terms.

### Evolutionary Expectations for Attractiveness–Health Links in Developed Societies and in General

Several theoretical considerations from evolutionary discussions cast doubt on the appropriateness of expectations for positive health–attractiveness links either specifically in developed societies or in general. Some examples of why such health links might not be expected follow.

#### *Ancestral Environments*

Theories from evolutionary psychology typically involve claims that a given set of relationships were found in ancestral environments but that specific aspects of those relationships may or may not hold in modern environments because of important differences with ancestral environments. Such a stance may seem to insulate claims from testability, but it need not be so. Better research from evolutionary psychology tests specific claims about the aspects of ancestral relationships that are expected to be found in modern environments and also tests specific claims about the nature of the interference from modern environments when such relationships are expected not to be found.

In the attractiveness–health literature, some researchers have claimed that although the tendency to base attractiveness judgments on the posited cues holds in modern environments, technological advances have partially or even fully severed the past relationship between these cues (and thus attractiveness itself) and health outcomes (B. C. Jones et al., 2001; Thornhill & Grammer, 1999). We are not aware of studies that use such notions to test specific theories of the location of modern technological interference with the hypothesized ancestral effects.

#### *Focus on Reproductive Success*

Evolutionary theorists such as Getty (2002) and Kokko, Brooks, McNamara, and Houston (2002) have stressed that the bottom line in modern evolutionary theory is reproductive success and that health and survival are important only insofar as they contribute to higher reproductive success. Given different life histories, for example, one might find the most reproductively successful males in a given species in a given ecology having reduced longevity or worse phenotypic condition, assuming the males are trading these off against increased reproductive success across their shorter lives. Thus, one might find either positive or negative correlations between attractiveness and health, even if attractiveness honestly signals genetic advantages leading to higher reproductive success.

### *Subtle Distinctions*

Some claims hold that posited health–attractiveness relationships may exist, but only among more subtle aspects of relevant features that have not typically been tested. A central example involves the particular aspects of health that may or may not relate to attractiveness. Citing predictions for health might implicate different things on the basis of what, exactly, one thinks ought to lead to greater long-term fitness. “Health” could include increases in immune system efficacy and, thus, lower levels of pathogen-based disease. “Health” could include metabolic efficiency, whereby some individuals achieve greater fitness in a more energy-efficient manner. “Health” could refer primarily to developmental health and young-adult health that lead to greater reproductive success in critical reproductive years but not necessarily to better late-age survival. “Health” could disproportionately implicate aspects of reproductive health leading to high fertility (i.e., the ability to produce children). Thus, some null findings may be irrelevant if one of these aspects of health is important to a given theorist’s predictions and another is not.

Another example involves different symmetry measures. Most of the claims cited above make general statements about symmetry correlating with attractiveness and health, but the theoretical discussions tend to make predictions only about FAs as opposed to directional asymmetries (DAs)—the latter are asymmetries in traits that show up on a population-wide level, whereas the former are asymmetries in traits that tend not to be directionally asymmetric in the population (see Simmons et al., 2004, for a review).

### The Present Review

In this review we examine claims that in developed Western societies substantial links exist between attractiveness and health both in general and with respect to certain widely discussed specific cues, in particular, symmetry, body size and shape, face masculinity/femininity, and face averageness. We assess the current state of the research findings and whether those findings are properly interpreted as supporting claims that such substantial relationships exist.

### *Retrieval of Studies*

We retrieved studies initially through PsycLIT, PsycINFO, and MEDLINE databases by searching for the keywords *attractiveness* and *physical attractiveness*. We retrieved studies cited in major reviews of health–attractiveness claims that we identified (Grammer et al., 2003; Langlois et al., 2000; Miller & Todd, 1998; Thornhill & Gangestad, 1996, 1999; Thornhill & Moller, 1997). We also manually inspected all issues of the journal *Evolution and Human Behavior* for relevant studies back to 1990. We examined studies cited in each relevant article identified in our search. Finally, we used the ISI Citation Indexes to search for more recent studies that had cited some of the major reviews and primary studies. We review studies published through late 2004.

### *Limitations*

We limit our review in several ways. First, we do not review evidence from nondeveloped, non-Western countries. The primary claims we review are based on evidence from samples from

developed Western societies and make general statements intended to apply to the developed Western societies in which the writers and readers of the claims are located. We understand that some of the theoretical suggestions mentioned above indicate that, in fact, it is precisely data from nondeveloped societies that are most relevant, but again, those are not the claims we review here. Further, studies from multiple nondeveloped societies are currently scarce.

A second important limitation of our review is that we do not review evidence for within- and between-individual differences in any of the relationships at issue. For example, several recent studies investigate whether women’s preferences for different traits in men (e.g., masculine faces or symmetry) might change over the menstrual cycle or differ on the basis of the women’s attractiveness or sociosexuality (for a review, see Penton-Voak et al., 2003). These are interesting studies, and we believe some of them are promising. However, the claims we review are general ones, not condition dependent.

A third important limitation is that we do not review evidence for the associations between attractiveness or the proposed cues and reproductive success—measured by number of children or age at first child, for example. We do review evidence for the association between attractiveness (and the proposed cues) and indicators of fertility in its medical but not demographic sense. These include indicators such as male sperm quality and female miscarriage rates and success in in vitro fertilization procedures. We refer to these as indicators of *reproductive health* as opposed to indicators of *fertility* to remain clear about the scope of our review in this regard. We acknowledge that there exists evidence, for example, that more attractive people and taller men may have more children in developed Western societies, and these are interesting findings that should be examined further. But our review is centrally about claims relating to differential physiological condition.

In addition, we limit our review to directly relevant studies only. For example, we restrict our review to studies showing that a trait does or does not affect people’s judgment relating specifically to physical attractiveness, not judgments relating to desirability as a mate or a person’s number of sexual partners.

In summary, we review evidence for a set of simple, direct claims for attractiveness–health links in developed Western societies. We review what is known about certain proposed correlates of physical attractiveness judgments and what is known about the relationship between physical attractiveness and these correlates on the one hand and health on the other. We first address body attractiveness, primarily reviewing research on BMI (and related somatotypes), WHR, height, and symmetry, and then we address face attractiveness, primarily reviewing research on averageness, masculinity/femininity, and symmetry. Then we summarize and discuss the current evidence.

## Attractiveness–Health Links in Body Characteristics

### *Body Characteristics and Body Attractiveness*

#### *Women’s Body Size and Shape*

Research on the size and shape correlates of women’s body attractiveness most commonly uses measures of BMI and WHR. BMI is a standard measure of weight, calculated by dividing

weight in kilograms by height in meters squared. BMIs below 18.5 are typically considered underweight, BMIs from 18.5 to 25 are typically considered normal weight, BMIs from 25 to 30 are typically considered overweight, and BMIs over 30 are typically considered obese (National Heart, Lung, and Blood Institute [NHLBI], 1998). WHR is calculated by dividing waist circumference by hip circumference. It is a measure of the relative distribution of fat in the lower body. Young adult women typically fall in the .70 to .90 WHR range and young adult men typically fall between .80 and .95 (Zaadstra et al., 1993). Differences in WHR arise in part from hormonal differences, with circulating estrogen causing fat cell accumulation in the hip region (buttocks and thighs) and inhibiting fat cell accumulation in the waist region and circulating testosterone causing accumulation of fat cells in the waist region and inhibiting fat deposits in the hip region (DeRidder et al., 1990; Furnham, Tan, & McManus, 1997). WHR and BMI are positively correlated, with one study finding a correlation of .57 ( $n = 119$ ) between the two (Jasienska, Ziomkiewicz, Ellison, Lipson, & Thune, 2004).

*Studies of weight or BMI and attractiveness.* Tovee, Benson, Emery, Mason, and Cohen-Tovee (2003) had women use a computer program that manipulated a picture of a body to add or remove fat from particular areas. Women using the program ( $n = 137$ ) set the ideal female BMI on average at 20.3, which is at the low end of the normal range. For self-ratings of attractiveness in typically distributed samples, women in the overweight BMI range rate themselves the least attractive (Cash & Hicks, 1990; McCreary & Sadava, 2001), and women in the underweight BMI range consider themselves the most attractive (McCreary & Sadava, 2001).

Several studies of the effects of weight on body attractiveness have used simple line drawings of front views of figures that are claimed to vary independently in WHR and weight. The primary stimuli originated with Singh (e.g., Singh, 1993a, 1995b) and consist of 12 line drawings of each sex with four WHR categories (.7, .8, .9, and 1.0) and three weight categories (underweight, normal weight, and overweight). Studies in developed Western countries for the attractiveness of these line drawings as a function of weight have consistently found that the overweight female figures are judged the least attractive (Furnham et al., 1997; Henss, 1995; Singh, 1993a, 1993b, 1994a, 1994b, 1995b). The relative preferences between under- and normal-weight figures have typically favored the normal-weight figures (Furnham et al., 1997; Singh, 1993a, 1993b, 1994a, 1994b, 1995b), although Henss (1995) found that underweight figures were preferred.

Tassinary and Hansen (1998) developed an expanded set of 27 alternative line drawings that were claimed to vary independently in weight, waist size, and hip size. Their alternative line drawings produced results with a strong role in attractiveness judgments for weight, a moderate role for hip circumferences, and no role for WHR. Replications using the Tassinary and Hansen line drawings have also pointed to the importance of weight in attractiveness judgments of these drawings. Forestell, Humphrey, and Stewart (2004) used Tassinary and Hansen's stimuli, finding that weight and waist and hip measures were all important to determining attractiveness judgments. Furnham, Moutafi, and Baguma (2002) used a subset of the Tassinary and Hansen stimuli and found light figures preferred over heavy figures.

Tovee and colleagues have used color photos of individuals' bodies (with heads obscured) to determine the gross body features that predict attractiveness ratings (Tovee & Cornelissen, 2001; Tovee, Maisey, Emery, & Cornelissen, 1999; Tovee, Reinhardt, Emery, & Cornelissen, 1998). For women, they have found that BMIs in the high teens and low 20s are rated most attractive, with a sharp drop-off for BMIs lower than that range and a gradual drop-off for BMIs higher than that range (such that, e.g., BMIs in the low teens [anorexic levels] are rated at about the same low levels as BMIs in the low 30s [obese levels]). Thornhill and Grammer (1999) also used photos of women's bodies, in the nude and taken from both front and back, to test the correlates of body attractiveness ratings. One potential problem with this sample, however, is that the women were in an unusually low and restricted BMI range ( $M = 19.4$ ,  $SD = 1.7$ ; the sample consisted of women responding to a newspaper ad in Los Angeles placed by an artist, so one can imagine that this sample consisted largely of would-be actresses and the like). Nonetheless, they found that BMI had a strong relationship with ratings of back-side attractiveness ( $r = -.53$ ,  $n = 92$ ) and a moderate relationship with ratings of front-side attractiveness ( $r = -.35$ ,  $n = 92$ ). Unfortunately, they did not report nonlinear relationships, which Tovee's studies would suggest were likely present if the sample contained a significant portion of women with BMIs lower than the high teens (Tovee & Cornelissen, 2001; Tovee et al., 1999; Tovee et al., 1998).

*Studies of WHR and attractiveness.* Tovee et al. (2003) had women use a computer program that manipulated a picture of a body to add or remove fat from particular areas. Women using the program ( $n = 137$ ) set the ideal female WHR on average at .79. In a study of self-ratings of attractiveness, Singh (2004) found a correlation of  $-.39$  ( $n = 144$ ) with WHR among young White women.

Several studies of the effects of WHR on body attractiveness have used Singh's simple line drawings of front views of figures described above. For women, Singh's (1993a, 1993b, 1994a, 1994b) work has consistently shown that the lower .7 WHR is judged most attractive among the female line drawings, whereas Henss's (1995) replication (using the same drawings) showed a preference for .8 over .9 over .7, and Furnham et al.'s (1997) replication (using the same drawings) found that raters preferred .7 and .8 WHRs equally (with the marginal advantage to .8).

Streeter and McBurney (2003) modified Singh's method by using a single photograph of a woman's body and creating computerized alterations with 27 total categories consisting of all possible combinations of three different widths for waist, hip, and chest, resulting in five different WHRs (.5, .6, .7, .9, and 1.2). They found a curvilinear relationship between attractiveness and WHR, with .7 the highest and .5 and 1.2 the lowest. We note, however, that the differences between attractiveness ratings for .7 on the one hand and .6 and .9 on the other hand were relatively trivial, and, as mentioned, most women in developed countries fall in this range—indicating that the truly less attractive values were those falling well outside of usual WHR ranges.

Tassinary and Hansen (1998), using their alternative 27 line drawings, found a strong role in attractiveness judgments for weight and a moderate role for hip circumferences but no role for WHR. Replications using the Tassinary and Hansen drawings, however, have found independent effects for WHR. Forestell et al. (2004) used Tassinary and Hansen's stimuli and found that .7

WHR was preferred at all weight levels and that weight and waist and hip measures were all important to determining attractiveness judgments. Furnham et al. (2002) used a subset of the Tassinary and Hansen stimuli and found .7 WHR preferred over .9, preferred over .5.

Henss (2000) used photos of six attractive women with WHRs from .7 to .79 and created one altered set by expanding the waists (resulting in WHRs from .71 to .85) and another altered set by narrowing the waists (resulting in WHRs from .68 to .74). The set with the narrowed waists was found more attractive than the unaltered set, which was found more attractive than the set with expanded waists.

In studies using photographs of unaltered women's bodies (with faces obscured), with a range of WHRs from .68 to above .9, Tovee and colleagues (Tovee & Cornelissen, 2001; Tovee et al., 1998, 1999) have found that lower WHRs are indeed found more attractive in women, even after controlling for BMI. Nonetheless, these studies have found that BMI had the far greater effect compared with WHR. Thornhill and Grammer (1999) found negative correlations between WHR and attractiveness judgments for photographs of 92 nude women's front sides ( $r = -.16$ ) and back sides ( $r = -.24$ ), though they found as well that BMI had substantially larger correlations with attractiveness ( $r_s = -.35$  and  $-.53$  for fronts and backs, respectively). Tovee, Hancock, Mahmoodi, Singleton, and Cornelissen (2002), using a range of BMI from 18.0 to 25.8 (approximately the full "normal" range of female BMIs) and a range of WHRs from .66 to .84, found similar correlations (BMI:  $r = -.53$ ; WHR:  $r = -.21$ ) and further found no significant interaction between the two.

Overall, then, it appears that both BMIs in the lower end of the normal range and lower WHR are relatively consistently found more attractive in Western women, that BMI and WHR probably have independent contributions to attractiveness judgments despite being positively correlated, that BMI likely has the stronger effect of the two, and that both BMI and WHR are maximally attractive not at their lowest possible ranges but at ranges at the lower end of typical female distributions (BMIs closer to 20.0 and WHRs closer to .7).<sup>1</sup>

### *Men's Body Size and Shape*

*Body size from fat and muscle.* For self-ratings of attractiveness in typically distributed samples, men in overweight BMI ranges, like women, rate themselves less attractive, though men in higher BMI ranges rate themselves as more attractive than women in higher BMI ranges (Cash & Hicks, 1990; McCreary & Sadava, 2001). Men consider themselves least attractive in the underweight BMI range, in contrast to women, who consider themselves most attractive in the underweight BMI range (McCreary & Sadava, 2001).

Results for the attractiveness of Singh's male line drawings as a function of weight have consistently shown that the overweight figures are judged the least attractive (Furnham et al., 1997; Henss, 1995; Singh, 1993a, 1993b, 1994b, 1995b). Whereas Singh (1993a, 1993b, 1994b, 1995b) and Furnham et al. (1997) have found that normal-weight male figures are judged most attractive, Henss (1995) found that under- and normal-weight male figures did not differ in rated attractiveness.

A different line-drawing study used the somatotypes that Sheldon had defined and measured (Sheldon, Dupertuis, & McDermott, 1954; Sheldon, Stevens, & Tucker, 1940). Sheldon argued that each person's body could be rated as having a degree of three independent dimensions or somatotypes: endomorphy (fatness, softness), mesomorphy (muscularity), and ectomorphy (leanness). More recently, Sheldon's somatotyping procedures, which are somewhat subjective measures, have been replaced with the Heath-Carter anthropometric somatotypes, a set of standard measures involving skin fold measures to quantify endomorphy, a set of limb breadth and girth measures corrected for height and fatness to quantify mesomorphy, and a height-to-weight ratio (similar to BMI) to quantify ectomorphy (Carter & Heath, 1990). Dixon et al. (2003) had female participants rate line drawings of paradigmatic examples of Sheldon's (Sheldon et al., 1940, 1954) three somatotypes along with an average stimuli, finding that the women strongly preferred the mesomorph type (followed by average, then ectomorph, then endomorph).

Maisey, Vale, Cornelissen, and Tovee (1999) had female participants rate the attractiveness of 50 photographed front-view male bodies, bodies that showed a range of different BMIs, WHRs, and waist-to-chest ratios (WCRs). They found in a multiple regression analysis that WCR was the primary predictor, accounting for 56% of the variance in a linear relationship, in which smaller WCRs (indicating larger chests relative to waists) predicted increased attractiveness. BMI was also a significant predictor, accounting for about 13% of the variance in a curvilinear relationship, in which BMIs in the low 20s were judged most attractive, with drop-offs on both sides (and ratings particularly low as BMIs approached 30.0). WHR was not a significant predictor.

Other studies have also found that women prefer men with inverted triangular upper bodies, that is, with relatively high chest-to-waist (or shoulder-to-waist) ratios. This conclusion has emerged from silhouette studies using, for the most part, undergraduate female judges (Hovarh, 1981; Salusso-Deonier, Markee, & Pedersen, 1993) as well as from self-reports of what is important to women about a man's body (Franzoi & Herzog, 1987). Beck, Ward-Hull, and McLear's (1976) silhouette study suggests that there may be limits to women's preference for larger chests, finding that undergraduates found moderately large chests more desirable than yet larger chests. A similar result was reached by Dixon et al. (2003), who had raters rate the attractiveness of

<sup>1</sup> An additional study by Puhl and Boland (2001) used computer manipulations of two photos to create six female stimuli that were claimed to represent three different weight categories and two different WHRs. The study reports the finding that men prefer low BMI and high WHR, in contrast to Singh's (1993a, 1993b, 1994a, 1994b) findings for preference for normal BMI and low WHR. However, analyses presented in the study showed that raters viewed the low WHR conditions as having significantly higher weight than the high WHR conditions to the point that the low WHR figure from the underweight category was judged the same weight at the high WHR figure from the normal-weight category. Also, in inspecting the stimuli in comparison to Singh's, Puhl and Boland's underweight women more closely resemble Singh's normal-weight women, whereas Puhl and Boland's normal-weight category more closely resembles Singh's overweight category. Although Puhl and Boland reported a preference among their raters for the lower weight photos, their data seem not inconsistent with any of the other findings given the higher weight range.

mesomorph line drawings with different WCRs, finding a strong preference for a .6 ratio, followed by .7, .5, and .8.

Line-drawing studies have shown that male WHRs in the higher (typically male) range around .9 are judged more attractive than WHRs in the low (typically female) range (Dixson et al., 2003; Furnham et al., 1997; Henss, 1995; Singh, 1995b).

One study varied several parameters of male silhouettes including the presence or absence of a protruding abdomen (other factors were slouched vs. straight shoulders, thick vs. thin neck, head up vs. bent forward, V shape vs. pillar shape; Gitter, Lomranz, & Saxe, 1982). When university women from Boston and Tel-Aviv rated the drawings for attractiveness, the body characteristic that accounted for the greatest variance was the presence versus absence of a protruding abdomen; it accounted for 53% of the variance (collapsing across cultures). This finding contrasts somewhat with the studies finding chest size in relation to waist size to be the primary determinant, though the other studies did not specifically include protruding abdomens.

The dominant theme for men appears to be the attractiveness of the simultaneous presence of high muscularity and low fatness, which in the end makes BMI alone an insufficient measure given that it confounds somewhat men with high muscularity and moderate fatness. Unattractive male bodies appear to come in two forms in typical populations, those that are skinny (low fatness and low muscularity) and those that are high fat relative to muscularity.

*Body size from height.* In light of how easily and reliably height can be measured, there is a surprisingly thin literature on the relation of height to physical attractiveness. Instead, studies have tended to focus on independent female preferences for male height, as opposed to whether men's height affects women's judgments of their physical attractiveness per se. For example, women have been found to express direct preferences for men who are taller than they are (Pawlowski, 2003; Sheppard & Strathman, 1989), taller men have been found to receive more responses in personals advertisements (Lynn & Shurgot, 1984; Pawlowski & Koziel, 2002), women have been found to go out with their taller dates more often than their shorter dates (Sheppard & Strathman, 1989), taller men have been found to have higher numbers of serious relationships (Nettle, 2002a), and taller men have been found to be more likely to marry and have children (Pawlowski, Dunbar, & Lipowicz, 2000) and to remarry upon divorce and have additional children (Mueller & Mazur, 2001). Nonetheless, it is possible that if one were to line up a group of men and have women rate their physical attractiveness, the women's judgments would be independent of the men's height—and yet at the same time the women may say they prefer dating taller men. Height may matter in mating decisions (as do education, income, generosity, etc.) and yet not be attractive in the sense that it affects judgments of how good looking men are.

Sheppard and Strathman (1989) asked male and female college students to report on the attractiveness of their dates and their dates' heights. Despite expressing preferences for taller men and dating taller men more frequently, there was neither a linear nor a curvilinear relationship between the males' height and the females' rating of their attractiveness. This finding suggests that male height might be desirable independently of, and not be a component of, male physical attractiveness. Macintyre and West (1991), on the other hand, did find a positive relationship between height and attractiveness. Their study involved 1,000 15-year-old adolescents

in western Scotland. Attractiveness ratings were recorded for three interviewers who interacted with the adolescents. Positive relationships of height to attractiveness were found for both genders.

### *Body FA*

FA measures deviations from perfect bilateral symmetry in traits that on average show no DA in populations (Simmons et al., 2004). It is thought to be a negative measure of developmental stability and to be increased by genetic stress (harmful mutations, homozygosity, etc.) and environmental stress (parasites, overcrowding, pollution, etc.; Gangestad & Thornhill, 1997; Manning, Koukourakis, & Brodie, 1997; Parsons, 1990, 1992).

We know of no studies that have actually reported correlations between measured body FA and ratings of body attractiveness in typical populations. The following studies, then, merely approach but do not address head-on the issue at hand, that is, whether body symmetry may contribute to perceptions of body attractiveness.

Tovee, Tasker, and Benson (2000) conducted a computer-enhanced symmetry study comparing photographs of 25 women's bodies with manipulated images of those photographs to produce perfect symmetry. When raters simply rated the attractiveness of the bodies, no difference was found between ratings of the original and enhanced-symmetry photos. In a forced-choice design, however, raters showed a slight but significant preference for the enhanced-symmetry version (in 55.5% of cases raters preferred the enhanced-symmetry version, and in 44.5% of cases they preferred the unadulterated version). These results indicate that although symmetry may matter for judgments of female body attractiveness, it probably matters very little.

Singh (1995a) used line drawings of female figures that varied in WHR and breast symmetry and claimed to have found that both mattered for attractiveness judgments. However, the effects for breast asymmetry were small, and Singh (1995a) created breast asymmetry in his drawings by having one breast sag noticeably, which resulted in raters judging the drawn figure to be significantly older. Dixson et al. (2003) found the opposite for women's judgments of male line drawings—the less symmetric was preferred to the perfectly symmetric. In general, though, asymmetries in real bodies are very subtle visual cues, and it is unclear to us that these kinds of line-drawing studies are appropriate for studying them.

### *Body Attractiveness and Health*

We are not aware of any study from developed societies correlating body attractiveness with actual health outcomes. Several correlates of body attractiveness, however, have known relationships to health outcomes.

### *Body Characteristics and Health*

#### *BMI*

Obesity has long been an identified risk factor for a variety of serious illnesses and mortality. The evidence comes from a large number of studies, many with samples that are representative of the general population and very large. High BMI is associated with increased incidence of and mortality from a variety of specific diseases, including hypertension; adult-onset diabetes; coronary

artery disease; stroke; gallbladder disease; osteoarthritis; sleep apnea and respiratory problems; and endometrial, breast, prostate, and colon cancers (Gilmore, 1999; Milligan et al., 1997; Must et al., 1999; NHLBI, 1998; Pi-Sunyer, 1993). In general, high BMIs are associated with overall all-cause mortality risk (NHLBI, 1998) as well as lower overall self-ratings of health in men and women (McCreary & Sadava, 2001). Further, BMIs in the normal range are not equally healthy. For women within the normal range of 18.5 to 25, for instance, the higher ranges are associated with increased risk of coronary heart disease (Willet et al., 1995).

The evidence on overweight BMI and health is less consistent. On the one hand, people with anorexia are known to suffer from a number of serious health complications and from markedly increased overall risk of mortality (Deter & Herzog, 1994). On the other hand, health outcomes in typically distributed populations often report better health in the underweight BMI range, especially for women. In McCreary and Sadava (2001), for example, self-reports of overall physiological health among women were highest in the underweight category and lowest in the overweight category, whereas among men they were highest in the normal-weight category and lowest in the underweight category. This is consistent with some findings from the medical literature generally, which show worse health outcomes and increased mortality risk among underweight individuals, resulting in a J-shaped relationship between BMI and health problems (Folsom et al., 1993; Manson et al., 1995; NHLBI, 1998).

Obesity has been linked to a wide variety of reproductive problems in women, including complications of pregnancy, menstrual irregularities, amenorrhea, ovulatory infertility (polycystic ovarian syndrome), increased risk of late fetal deaths, increased morbidity for mother and child, and increased risk of congenital abnormalities (NHLBI, 1998). Severely underweight women (e.g., those with anorexia) experience menstrual irregularities, amenorrhea, and nonovulation (De Souza & Metzger, 1991). Anorexia has been linked to problems carrying children. In one study of 66 women with a history of anorexia, though the women were equally likely to have become pregnant as controls, anorexia was associated with higher miscarriage rates, higher premature birth rates, and lower birth weights (Bulik, Sullivan, Pickering, Dawn, & McCullian, 1999).

Studies of in vitro fertilization patients have produced equivocal results, suggesting that BMI might be a weak predictor of pregnancy rates among these patients. The largest study (Zaadstra et al., 1993, 500 women) showed a slight drop in pregnancy rates for women with BMIs under 20 and a bigger drop for women with BMIs over 30, but it further found that WHR and age were better predictors than BMI. A second study (Wass, Waldenstrom, Rossner, & Hellberg, 1997, 220 women) found no relationship between BMI and pregnancy rate.

### WHR

Distribution of body fat is known to be an independent risk factor for a number of serious diseases and mortality over and above BMI or percentage of body fat (NHLBI, 1998). This is due in part to the fact that fat cells differ in morphology and physiological function depending on their location on the body (Bjornorp, 1991; Rebuffe-Scrive, 1991). However, the National Institutes of Health view waist circumference alone a marginally better

measure than WHR in determining overall health risks (NHLBI, 1998), though WHR is predictive as well (Bjornorp, 1988). In a study of more than 40,000 Iowa women aged 55 to 69 years, WHR was found to be the better predictor of 5-year mortality risk than BMI, though both were predictive (Folsom et al., 1993). A waist above 40 in. (101.6 cm) in men and 35 in. (88.9 cm) in women is known to carry substantial increased risk for a variety of poor health outcomes and mortality, independent of BMI (NHLBI, 1998).

In women, WHR has been a promising candidate for effects on reproductive health because of its close relationship with sex-typical hormones (DeRidder et al., 1990; Furnham et al., 1997). Higher WHRs in women are associated with higher plasma testosterone loads and specifically with polycystic ovary syndrome and idiopathic hirsutism (two conditions associated with increased androgen secretion by the ovaries, with the former also involving a lack of ovulation; Evans, Barth, & Burke, 1988).

Two large studies of in vitro fertilization patients have identified WHR as a predictor of pregnancy rates among these patients (Wass et al., 1997; Zaadstra et al., 1993). Both studies found WHR to be the best predictor among their tested variables, including BMI and age, with lower WHRs associated with about double the pregnancy rates of higher WHRs. In addition, Jasienska et al. (2004) found that WHR correlated across women's menstrual cycles with concentration of progesterone and 17- $\beta$ -estradiol, two reproductive hormones associated with higher conception probabilities.<sup>2</sup>

### Men's Muscularity

For men, as we have seen, BMI alone is an unsatisfying measure because men's attractiveness depends more on body shape indicating higher versus lower levels of muscularity in relation to body fat (e.g., low WCR, or a mesomorphic somatotype). Although most modern health studies employ BMI, which conflates larger body sizes on the basis of higher amounts of fat and muscle, some have also used Sheldon's (Sheldon et al., 1940, 1954) somatotypes. The operative question for our purposes is whether men who are large because of muscularity (who are more attractive to women) are healthier than men who are fat and men who are thin (who are both less attractive). We have clear evidence from BMI studies that larger men are less healthy, but is it only the men who are large because of fatness who are less healthy? That is, is it only high endomorphy that predicts worse health, or is high mesomorphy a predictor as well?

Most studies of cardiovascular disease in men identify both increased mesomorphy as well as increased endomorphy as risk

<sup>2</sup> On the other hand, Tovee, Mason, Emery, McCluskey, and Cohen-Tovee (1997) have made an interesting point with regard to women with anorexia. Tovee et al. (1997) described a sample of women with anorexia in which the average WHR was .76, a WHR that was indistinguishable from the .74 WHR in a sample of normal women. But women with anorexia typically do not ovulate or menstruate (De Souza & Metzger, 1991). Further, although underweight women can regain normal ovulation patterns through weight gain, there is some evidence (mentioned above) that women with a history of anorexia have higher miscarriage and premature birth rates and lower birth weights (Bulik et al., 1999). Thus, WHR alone would appear to misread the fertility status of very thin women.

factors, with ectomorphy alone being associated with better risk-factor and outcome measures (Damon, Damon, Harpending, & Kannel, 1969; Gertler & White, 1954; Malina, Katzmarzyk, Song, Theriault, & Bouchard, 1997; Paul et al., 1963; Smit, Daehne, Halhuber, & Stocksmeier, 1979; Spain, Nathan, & Gellis, 1963; Williams et al., 2000). It appears that combinations of increased mesomorphy with increased endomorphy might signal the largest risk (Carter & Heath, 1990).

### *Men's Height*

There have been several large-scale surveys examining the relationship between height and health. Peck and Vagero (1989) reported on a survey of a large sample comprising more than 10,000 randomly selected Swedes who were monitored for 6 years. The excess risk of death for the shortest one third of both men and women was about 20%, and when one controlled for both current socioeconomic status and childhood socioeconomic status, the excess risk was reduced, but only to about 15%. Relatively short men and women also classified their health as poorer than did taller men and women, even after controlling for class.

Similar results were found in a 1994 Finnish survey of more than 8,000 men and women. Among men there was a linear relationship between body height and self-reported general health as well as a negative linear relationship with the presence of chronic, limiting diseases. The differences between the tallest and the shortest men remained after controlling for childhood economic problems, alcohol problems in the childhood home, and education (these variables were all correlated with adult height). The residual odds ratios were 0.75 for tall men and 1.30 for short men (Silventoinen, Lahekma, & Rahkonen, 1999).

An inverse relationship between coronary artery disease and height has been found in several large-scale studies. Two studies involving three large samples have found that height was inversely related to ischemic heart disease (Walker, Shaper, Phillips, & Cook, 1989; Yarnell, Limb, Layzell, & Baker, 1992). Walker et al. (1989) also found height to be directly related to social class, and social class is inversely related to the incidence of heart disease, but height remained correlated to heart disease when controlling for social class. In a subsequent follow-up study of the same sample, height was again found to be inversely proportional to the incidence of ischemic heart disease and was also found to relate to fatal (but not nonfatal) strokes (Wannamethee, Shaper, Whincup, & Walker, 1998); men in the shortest quintile were significantly more likely to experience fatal strokes than were men in the other four quintiles (see also Barker, Osmond, & Golding, 1990; Herbert et al., 1993; Kee et al., 1997; Krahn, Manfreda, Tate, Mathewson, & Cuddy, 1994; Waaler, 1984).

However, there are also reports in the literature suggesting that height is associated with poor health and early mortality. First, there have been reports of positive relationships between height and cancer risk (Shors, Solomon, McTiernan, & White, 2001). The risk varies with type of cancer, and in general the increased risk from height appears to be relatively weak. Increased height has been shown to increase the risk, for example, of lung cancer (Gunnell, May, Ben-Shlomo, Yarnell, & Smith, 2003), pancreatic cancer (Michaud et al., 2001), and skin cancer (Shors et al., 2001).

Also in accord with the idea that height is associated with poor health and mortality, Samaras and Storms (1992) studied 373 male

veterans who died between 1984 and 1988, mostly in the San Diego Veterans Affairs Hospital. The veterans' ages at death ranged from 29 to 97. The causes of death were for the most part heart disease, cancer, stroke, and liver failure. The correlation between weight and age at death was  $-.20$ ; the correlation between height and age at death was  $-.23$ . The multiple correlation that resulted from regressing age at death on height and weight was  $.26$ , with betas of  $-.17$  and  $-.13$ , respectively (all  $ps < .001$ ). It is striking that the correlations of height and weight are approximately equal. The authors reported several other studies of the relationship of height to longevity. One study looked at 3,200 deceased baseball players, and a steady decline in longevity with height was noted. In a second sample of famous men (numbering 253) for whom height data were available, men shorter than 5 ft. 9 in. (1.75 m) lived, on average, 4.6 years longer than those taller than 5 ft. 9 in. And in a study of West Point graduates, there was no association between height and mortality for the first 40 years after graduation, but from that point on increased height was associated with increased mortality (Mueller & Mazur, 2001).

Indeed, Samaras, Elrick, and Storms (1999) reviewed a variety of kinds of evidence suggesting that shorter men live longer. In light of the well-documented inverse relationship between height and coronary artery disease, it is difficult to explain these findings of a negative association between height and longevity. It should be said, however, that the studies finding an inverse relationship between height and longevity cited above tended to use samples of males who at least in early adulthood were physically reasonably fit—those inducted into the military, baseball players, and so on—whereas studies finding coronary artery disease decreasing with height tended to be large-scale surveys of the population as a whole. Thus, it might be that early childhood nutritional factors account for the inverse relationship between height and coronary artery disease but that those who suffered these nutritional deficits were selected out of the samples. This cannot be the whole story, however, because the Manitoba Follow-Up Study followed members of the Royal Canadian Air Force during World War II yet found a negative association between coronary artery disease and height, and presumably, this sample was selected for physically fit young men (Krahn et al., 1994). So a complete resolution of these two sets of data remains to be found.

### *Body FA*

Early interest in human FA began with observations of dental asymmetry in Down's syndrome patients and others and dermatoglyphic (i.e., fingerprint) asymmetries in individuals with schizophrenia (DiBennardo & Bailit, 1978; Livshits & Kobylansky, 1991). Further, a study comparing preterm to full-term infants found newborn body FA to be predicted negatively from gestational age and positively from infant cardiovascular problems, as well as weakly associated with infant respiratory problems and pregnancy complications (in particular, mother infections; Livshits et al., 1988).

Studies of adult populations suggest a small role for body FA as a health indicator, though results have not been consistent. Milne et al. (2003) used a sample of 965 men and women, relating a composite measure of FA for six body traits with a variety of health-related measures taken at age 26. They found (a) a modest relationship ( $p < .01$ ) between BMI and FA (though closer in-



spection found the relationship held for women but not men), (b) a small relationship ( $p < .05$  but not  $p < .01$ ) between asymmetry and reporting two or more past health conditions from a list that included anemia, arthritis, cancer, diabetes, epilepsy, heart trouble, hepatitis, kidney/bladder infections, and major surgery (they reported anecdotally that the strongest correlates with FA were hepatitis and major surgery), and (c) no relationship between asymmetry and having one or more of the above conditions, WHR, systolic blood pressure, total blood cholesterol, fitness, or periodontal disease.

Tomkinson and Olds (2000) looked at 21 men and 25 women on a range of health and performance indicators. Overall, they “failed to detect any relationship between symmetry and health-related physiological fitness” (p. 548), though their sample sizes were very small. Converting their correlations such that negative ones would be predicted by symmetry theory, their average correlation<sup>3</sup> between body FA measures and health indicators was .06 for men and  $-.01$  for women—this indicates that it was not low power alone that prevented the hypothesized effects from appearing.

Scutt, Manning, Whitehouse, Leinster, and Massey (1997) compared 250 breast cancer patients with 250 controls and found that breast FA accounted for 4% of the variance in predicting breast cancer after controlling for breast size (which was a stronger predictor and positively associated with breast FA).

Manning, Scutt, and Lewis-Jones (1998) looked at 53 men in an infertility clinic. Low FA between right- and left-hand fingers predicted higher sperm numbers, faster sperm, and more sperm migration (in addition, taller men had faster sperm, and thinner men had better sperm migration, though no explanation was attempted). Firman, Simmons, Cummins, and Matson (2003) looked at 50 Australian men. Low FA from a composite measure using ear length, fourth finger length, and foot length predicted higher sperm number, higher motility, and low sperm head length (a feature the authors said might be associated with reduced fertility).

## Attractiveness–Health Links in Face Characteristics

### *Face Characteristics and Face Attractiveness*

#### *Averageness*

The study of face averageness goes back at least to Galton (1879), who projected multiple faces onto a single photographic plate to create composite portraits. Many studies today use computer averaging to combine digital photographs or morph individual photographs into more- or less-typical shapes, but the idea is essentially the same. Other studies attempt to correlate ratings or measures of face averageness or typicality (or, conversely, face distinctiveness) with ratings of attractiveness and other characteristics.

Studies using computer blending techniques have tended to show that when individuals’ photographs are either blended with averaged composites or warped into a more-average shape, they are rated more attractive than the original photographs in both sexes (Langlois & Roggman, 1990; Little & Hancock, 2002; Rhodes & Tremewan, 1996; Rhodes, Yoshikawa, et al., 2001; Rhodes, Zebrowitz, et al., 2001). Grammer and Thornhill (1994), however, found that whereas composites were preferred to originals for female faces, raters preferred originals over composites for male faces.

In samples of unadulterated face photographs, studies have found moderate correlations (typically around .30) between ratings of averageness or typicality or (the inverse of) distinctiveness and ratings of face attractiveness (Morris & Wickham, 2001; Rhodes, Sumich, & Bryatt, 1999; Rhodes, Yoshikawa, et al., 2001; Rhodes, Zebrowitz, et al., 2001; Zebrowitz, Hall, Murphy, & Rhodes, 2002).

D. Jones and Hill (1993), instead of having raters judge averageness, actually measured averageness in a set of faces by determining the distance of face landmarks from their average positions. When these distances were large, faces tended to be judged less attractive in three different samples for both sexes, though the correlations were low to moderate in size and generally nonsignificant given the small sample sizes, typically around 40 to 50 individuals. For men, the average weighted correlation was  $-.24$ ; for women it was  $-.21$ .

### *Masculine and Feminine Face Features*

Several studies have examined the relationships between masculine and feminine face features and judgments of face attractiveness. These studies have used a variety of techniques, from computer programs that systematically manipulate images to measuring the dimensions of face features in samples of photographs.

Rhodes, Chan, Zebrowitz, and Simmons (2003) found a very large correlation between participants’ ratings of female faces’ femininity and attractiveness ( $r = .53, n = 156$ ), as did Koehler et al. (2004;  $r = .78, n = 100$ ). In addition, Koehler et al. (2004) found a significant relationship between a measure of actual sexual dimorphism and women’s face attractiveness ( $r = -.30, n = 99$ ), suggesting that, in fact, the relationship between femininity and female facial attractiveness is real and not just an effect of raters’ assumptions about attractive female faces. D. Jones and Hill (1993) reached similar results, in which a combination of features reflecting youth and femininity predicted ratings of women’s attractiveness.

Several studies have used computer averaging and morphing techniques to look at overall preferences for face masculinity and femininity in male and female faces. Most such studies report that exaggerated femininity is found more attractive in both female faces (Johnston, Hagel, Franklin, Fink, & Grammer, 2001; Perrett et al., 1998; Rhodes, Hickford, & Jeffery, 2000) and male faces (Little, Burt, Penton-Voak, & Perrett, 2001; Little & Hancock, 2002; Little, Jones, Penton-Voak, Burt, & Perrett, 2002; Perrett et al., 1998; Rhodes et al., 2000).

Yet other studies have found masculine features more attractive in men. Johnston et al. (2001) had women identify an average, an attractive, and a masculine male face along a smooth continuum of masculine and feminine male faces and reported that the selected attractive face was on the masculine side of average. However, there was no attempt to judge whether the women had accurately picked out the average male face, therefore it is not apparent that this finding contradicts those studies finding that women prefer male faces more feminine than actual composite averages. Other

<sup>3</sup> All averages of correlations in this article were calculated by converting the correlations into Fisher  $z$ s, then weighting by degree of freedom (typically sample size minus 2), averaging the results, and then converting back into correlations.

studies have correlated specific sexually dimorphic face features with ratings of male face attractiveness and have found that more sexually dimorphic features predict increased male attractiveness (Grammer & Thornhill, 1994; Penton-Voak et al., 2001; Scheib, Gangestad, & Thornhill, 1999), though these studies have found different, even contradictory, feature sets sexually dimorphic (e.g., Scheib et al., 1999, cheekbone prominence as masculine trait vs. Penton-Voak et al., 2001, cheekbone prominence as feminine trait).

Rhodes et al. (2003) found a positive though nonsignificant correlation between participants' ratings of male faces' masculinity and attractiveness ( $r = .11, n = 154$ ), and Koehler et al. (2004) found a significant relationship between men's face attractiveness and raters' impressions of face masculinity ( $r = .37, n = 94$ ). However, when using an actual measure of sexual dimorphism, Koehler et al. (2004) found a nonsignificant tendency for more feminine male faces to be rated as more attractive ( $r = -.14, n = 94$ ). These findings suggest that although raters might assume that attractive male faces are more masculine (because of assumptions about the desirability of masculinity for male faces), it is not in fact the case.

Finally, Swaddle and Reiersen (2002) had participants look at 21 male faces in both front and profile views, and they digitally manipulated those faces to increase and decrease the effects of testosterone on developing faces—testosterone, by their account, increases face height and increases the size of the lower jaw. They found, on the one hand, that women had an overall preference for male faces close to the center of the distribution and, on the other hand, that for any given face, women tended to prefer the version of that face that was adjusted toward the center of the distribution—that is, for male faces naturally showing high levels of testosterone, women tended to prefer the computer-manipulated version decreasing masculinity, and for male faces naturally showing low levels of testosterone, women tended to prefer the version increasing masculinity. Overall, whereas results on women show consistent preferences for feminine faces, the results for men are inconsistent and suggest that average male femininity/masculinity might be preferred in male faces.

### Face Symmetry

There are two basic kinds of studies that have explored the relationship between face symmetry and face attractiveness: (a) studies in which the face symmetry of photographed faces is manipulated through computer imaging techniques either to enhance or reduce symmetry so that raters can compare the altered faces with the originals and (b) studies that take available populations and correlate face attractiveness ratings with natural symmetry measures.

Several computer manipulation studies have revealed a preference for face symmetry in face attractiveness judgments for both male and female faces, comparing original faces with faces that have either been blended with their mirror images to produce symmetry or have been warped into symmetric images using landmarks on both sides of the face (Koehler et al., 2002; Perrett et al., 1999; Rhodes, Proffitt, Grady, & Sumich, 1998; Rhodes, Yoshikawa, et al., 2001; Rhodes, Zebrowitz, et al., 2001). One study has found such symmetric images less attractive (Swaddle & Cuthill, 1995), and two have found no preference (Kowner, 1996;

Noor & Evans, 2003) except in a sample of faces of very old people (Kowner, 1996). Rhodes, Roberts, and Simmons (1999) suggested that methodological differences in some of these studies explain many of the null findings, and they found that blending faces with mirror images to create symmetry resulted in more attractive symmetric images but creating left–left or right–right composites did not. Finally, Mealey, Bridgstock, and Townsend (1999) looked at 34 identical twin pairs and found that the more symmetric of the two twins was judged the more attractive.

These kinds of direct-comparison studies in fact prove little. In particular, while they show that a preference for symmetry exists, they do nothing to answer the crucial question of how much it matters. One can imagine any number of traits that would surely show up in a controlled-comparison preference study that in actuality are very minor mate selection criteria. For example, study participants who were offered two descriptions of a potential mate that were identical, except that one described the person having a lovely singing voice and the other described an awkward singing voice, would quite likely prefer the individual with a lovely singing voice, consistent with evolutionary claims (e.g., Miller, 2000) that musical displays bear fitness-relevant information and thus are logically found in mate-selection preferences. However, in a large-scale representative study comparing many different mate-selection criteria, quality of singing voice would likely be rather low on the list and not properly considered fundamentally important.

Several studies have compared the actual symmetry of photographed faces to raters' judgments of face attractiveness in a manner that allows for meaningful effect size measures. Some have found that raters' impressions of face symmetry correlate positively (typically around .30) with attractiveness judgments for men and women (Koehler et al., 2004; Rhodes et al., 1998; Rhodes, Sumich, & Bryatt, 1999; Rhodes, Zebrowitz, et al., 2001; Simmons et al., 2004; Zebrowitz et al., 2002).

The most straightforward design has been in studies that have actually measured face asymmetry and correlated these measures with ratings of face attractiveness. There have been several such studies, as shown in Table 1, which displays the results separately for men and women. In general, these studies show small effects in men (weighted average  $r = -.14$ ) and essentially no effect in women (weighted average  $r = -.06$ ). In a related study, B. C. Jones et al. (2004) had raters rate the similarity of male face photo pairs created by mirroring the left-half face for one photo and the right-half face for the other to determine the overall symmetry of the unadulterated face photos (the more similar they rated the left- and right-based photos, the more symmetric the original face was assumed to have been). This similarity rating was then correlated with attractiveness ratings for the set of men, finding a significant positive correlation of .21 between left–right similarity and attractiveness, which is generally consistent with the findings in Table 1 with respect to men.

Simmons et al. (2004) stressed that although many studies have measured asymmetries in faces, it is not clear that they have measured theoretically important FAs (in features that do not show population-level DA and are thought to be the types of asymmetries associated with developmental instability) and not theoretically irrelevant DAs (features that do show population-level DA, which are thought to be unrelated to developmental stability). Simmons et al. (2004) created composite measures of three cate-

Table 1  
Correlations Between Face Attractiveness and Face Asymmetry

Study	<i>n</i>	<i>r</i>
Men		
Rhodes, Zebrowitz, et al. (2001)	104	.06
Hume & Montgomerie (2001)	95	-.15
Koehler et al. (2004)	94	.09
Penton-Voak et al. (2001)	66	-.23
D. Jones & Hill (1993)	42	-.12
Scheib et al. (1999)	40	-.48
B. C. Jones et al. (2001)	30	-.43
D. Jones & Hill (1993)	23	-.22
D. Jones & Hill (1993)	23	.07
Shackelford & Larsen (1997)	18	.01
Shackelford & Larsen (1997)	16	-.24
Rikowski & Grammer (1999)	16	-.60
Grammer & Thornhill (1994)	16	-.54
Weighted mean <i>r</i>		-.14
Women		
Koehler et al. (2004)	100	-.06
Hume & Montgomerie (2001)	94	-.31
Rhodes, Zebrowitz, et al. (2001)	88	.22
D. Jones & Hill (1993)	52	-.01
D. Jones & Hill (1993)	51	-.15
D. Jones & Hill (1993)	41	.03
Shackelford & Larsen (1997)	41	.10
B. C. Jones et al. (2001)	30	-.41
Shackelford & Larsen (1997)	26	.02
Fink et al. (2001)	20	.09
Rikowski & Grammer (1999)	19	.14
Grammer & Thornhill (1994)	16	-.48
Weighted mean <i>r</i>		-.06

Note. Negative correlations are in the predicted direction.

gories of face asymmetry: FA, DA, and asymmetry variance about the population mean asymmetry of traits with DA (FA about DA). In their sample of 172 men and 205 women, they found that these three categories of asymmetry together accounted for a significant 4.5% of the variance in men's face attractiveness but did not account for a significant percentage of the variance in the attractiveness of women's faces. These findings are consistent with the measured asymmetry studies cataloged in Table 1 and discussed above, finding small effects in men and essentially none in women.

### BMI

Four studies have looked at the relationship between women's BMI and ratings of their face attractiveness. Two using nonlinear BMI measures have found large relationships, with multiple correlations of  $-.45$  ( $n = 94$ ; Hume & Montgomerie, 2001) and  $-.55$  ( $n = 19$ ; Rikowski & Grammer, 1999); one using a linear BMI term also found a large relationship, with a correlation of  $-.45$  ( $n = 100$ ; Davis, Shuster, Dionne, & Claridge, 2001); and another using a linear BMI term found a small but meaningful relationship, with a correlation of  $-.17$  ( $n = 92$ ; Thornhill & Grammer, 1999). Although there is good evidence that BMI substantially affects men's judgments of women's faces, there is only one study that correlated men's BMI with face attractiveness, and in that study

the two were only very weakly (nonsignificantly) negatively correlated ( $r = -.08$ ,  $n = 95$ ; Hume & Montgomerie, 2001).

### Face Attractiveness and Health

Studies correlating judgments of face attractiveness and rater impressions of target health produce very large positive correlations for both sexes, typically around .60 (Henderson & Anglin, 2003; B. C. Jones et al., 2001, 2004; Kalick, Zebrowitz, Langlois, & Johnson, 1998; Rhodes et al., 2003). The problem, of course, is that many attributions made on the basis of attractiveness have little basis in fact. In a meta-analysis by Feingold (1992), for example, it was shown that although people that are more attractive are perceived as more intelligent, capable, and so forth, there is essentially no relationship between attractiveness and actual intelligence, performance, and so forth. And where real differences are found, they tend to be differences caused by the very fact that people make positive attributions with regard to more attractive people—attractive people are less lonely and socially anxious, have better social skills, are more popular with the opposite sex, and have more same-sex friends (Feingold, 1992).

The crucial question with regard to face attractiveness and health, then, is whether attractiveness really does correlate positively with health outcomes. Four studies have looked at this question. The first was by Kalick et al. (1998), who used a large longitudinally studied group of 169 females and 164 males who were born in the 1920s and given detailed medical evaluations annually from ages 3 to 18 years and again in their 30s. The sample participants were photographed around age 17. Ratings of yearly health evaluations were combined to create composite measures for adolescent, middle adult, and late adult health. Kalick et al. then correlated the health measures with ratings of the targets' face attractiveness in their teens. The results revealed no overall relationship between health and face attractiveness for either men or women. The correlations for their male sample between attractiveness and health measures ranged from  $-.02$  to  $.05$  ( $n$ s from 56 to 164), with a weighted average of  $.02$ . The correlations for their female sample ranged from  $-.10$  to  $.10$  ( $n$ s from 66 to 169), with a weighted average of  $.00$ .

Shackelford and Larsen (1999) studied a sample of undergraduates reporting daily health symptoms over the course of a month, including headache, runny or stuffy nose, nausea or upset stomach, muscle soreness or cramps, sore throat or cough, and backache and also measured cardiovascular recovery. The average correlation between attractiveness and the health measures (converting correlations such that positive ones were expected) for the male sample was  $.17$  ( $n = 34$ ) and was  $.09$  for the female sample ( $n = 66$ ). Hume and Montgomerie (2001) looked at 189 university students (94 women and 95 men) and correlated face attractiveness judgments with a health rating based on the incidence and seriousness of past diseases, finding no relationship in men ( $r = -.03$ ,  $n = 95$ ) but a strong positive relationship between face attractiveness and past health for women ( $r = .39$ ,  $n = 94$ ). Finally, Henderson and Anglin (2003) looked at 25 male and 25 female high school yearbook photos from the 1920s and correlated rated attractiveness with year of death, finding significant positive relationships between longevity and attractiveness for men ( $r = .34$ ,  $n = 25$ ,  $p = .049$ ) and women ( $r = .36$ ,  $n = 25$ ,  $p = .038$ ).

Results from these four studies are summarized and averaged in Table 2 and are shown separately for men and women. As shown, face attractiveness appears to be a weak predictor of health in women (weighted average  $r = .15$ ), and it is clearly not a consistent predictor in men (weighted average  $r = .04$ ).

Soler et al. (2003) correlated women's ratings of the attractiveness of 66 men's photographed faces with properties of semen samples collected from the men. They found attractiveness significantly correlated with sperm motility ( $r = .28, p < .05$ ) and better sperm morphology ( $r = .33, p < .01$ ) but not sperm concentration ( $r = .03, ns$ ).

### Face Characteristics and Health

#### Averageness

Only one study has examined face averageness and health; Rhodes, Zebrowitz, et al. (2001) used both computer manipulation techniques and natural samples as well as longitudinal health measures in addition to raters' perceptions of targets' health. They found both that photographs that were computer manipulated to increase averageness were perceived by raters to be healthier than the original photos and that raters' ratings of the distinctiveness of faces (an inverse measure of averageness or typicality) correlated negatively with their ratings of their perception of the healthiness of the target in two samples for both sexes.

One of the samples used in Rhodes, Zebrowitz, et al. (2001) consisted of the large longitudinally studied group used in Kalick et al. (1998) and described above. Raters rated the distinctiveness of the photographed faces, and these ratings were correlated with health measures from childhood, adolescence, the time of the photograph, and later adulthood. Where a negative correlation indicates that more-typical faces are associated with better health, correlations ranged from  $-.28$  to  $-.05$  ( $ns$  from 78 to 153) for the male sample and from  $-.25$  to  $.06$  ( $ns$  from 91 to 161) for the female sample. The results for both sexes suggest a very small relationship between rated distinctiveness and actual health, with a weighted average correlation for the male sample of  $-.09$  and  $-.12$  for the female sample.

Table 2  
Correlation Between Face Attractiveness and Actual Health

Study	<i>n</i>	<i>r</i>
Men		
Kalick et al. (1998)	164	.02
Hume & Montgomerie (2001)	95	-.03
Shackelford & Larsen (1999)	34	.17
Henderson & Anglin (2003)	25	.34
Weighted mean <i>r</i>		.04
Women		
Kalick et al. (1998)	169	.00
Hume & Montgomerie (2001)	94	.39
Shackelford & Larsen (1999)	66	.09
Henderson & Anglin (2003)	25	.36
Weighted mean <i>r</i>		.15

Note. Positive correlations are in the predicted direction.

#### Face Masculinity/Femininity

Rhodes et al. (2003)—using the same sample from Kalick et al. (1998) and Rhodes, Zebrowitz, et al. (2001)—correlated actual adolescent health with rater impressions of face masculinity of 154 males and face femininity of 156 females. Their results showed a significant positive relationship between masculinity and health for men ( $r = .17, p < .05$ ) but no relationship between femininity and health for women ( $r = -.01, ns$ ).

#### Face Symmetry

Faces whose symmetry has been enhanced through computer manipulations have not only been shown to be perceived to be more attractive, but they have been perceived to be healthier as well (e.g., Rhodes, Zebrowitz, et al., 2001). When participants rate their impressions of the symmetry of faces, these ratings have been found to correlate positively (typically around .30) with ratings of apparent health (Grammer & Thornhill, 1994; Rhodes, Zebrowitz, et al., 2001). However, such links are less certain when replacing either impressions of symmetry with actual measures of symmetry or impressions of health with real health histories. Thus, although Rhodes, Zebrowitz, et al. (2001) found positive correlations between perceived symmetry and perceived health, (a) they found no relationship between perceived symmetry and actual health measured at several different points in a longitudinal study (correlations less than .06), and (b) they found no relationship between measured symmetry and perceived health (correlations less than .10). B. C. Jones et al. (2001, 2004) found negative relationships between measured face asymmetry and raters' impressions of health in both men and women.

Three studies have been more to the point, measuring asymmetry levels in faces and correlating them with actual health data. The first was by Shackelford and Larsen (1997), who had four groups of undergraduates (two male groups, with 16 and 18 individuals, and two female groups, with 26 and 41 individuals) keep daily journals of various health symptoms for a month, including headache, runny or stuffy nose, nausea or upset stomach, muscle soreness or cramps, sore throat or cough, and backache and measured their cardiovascular recovery. Shackelford and Larsen (1997) claimed to have found, and have been widely cited for having found (e.g., Hume & Montgomerie, 2001; Kalick et al., 1998; Mealey et al., 1999; Milne et al., 2003; Thornhill & Moller, 1997), that low face FA is associated with good physiological health. But their findings do not appear to support the claim: When one converts their correlations such that positive ones are expected, 4 of their 14 correlations for the male samples are positive, and 9 of the 14 correlations for the female samples are positive. A simple weighted averaging of correlations by symptom across the two male samples and the two female samples reveals that male correlations range from  $-.20$  to  $.05$ , and female correlations from  $-.05$  to  $.27$ . Overall, the weighted average correlation for the male samples between health and symmetry is  $-.08$  and  $.07$  for the female samples (with positive correlations expected), indicating little relationship between face FA and physiological health as a general matter in either sex (and, indeed, with the male relationships generally falling in the opposite of the predicted direction).

A second study, similar to Shackelford and Larsen's (1997), is Tomkinson and Olds's (2000), which measured a range of health

and performance indicators and correlated those indicators with body and face asymmetry measures for 21 men and 25 women. Converting their correlations such that negative ones would be predicted by symmetry theory, their average correlations between a composite face asymmetry measure and the various health indicators was  $-.01$  for men and  $-.02$  for women.

A third study of measured face asymmetry and actual health comes from Rhodes, Zebrowitz, et al. (2001) and used the same longitudinal study from Kalick et al. (1998) described above. That study also failed to find a link between face FA measured at age 17 and health measured at a variety of different times, including childhood, adolescence, age 17, and midadulthood. Where negative correlations were expected, the correlations for the male sample ranged from  $-.10$  to  $.10$  ( $ns$  from 49 to 104), and the weighted average was  $-.02$ . The correlations for the female sample ranged from  $-.20$  to  $.14$  ( $ns$  from 53 to 88), and the weighted average was  $-.06$ .

These three studies are therefore in broad agreement: There appears to be no meaningful relationship between measured face symmetry and actual health.

## Summary of Relationships and Discussion

### *Summary of the Primary Relationships*

At the most basic level—the question of whether attractiveness and health correlate positively—attractiveness–health claims find some confirmation among women but not among men in developed Western societies. With regard to bodies, although the relationship between body attractiveness and health outcomes has not been investigated directly, the relationship likely exists in the predicted direction among women in developed Western countries because the general features of the most attractive female bodies (primarily involving the lower ranges of normal BMI and secondarily involving low WHR) are securely known to predict better health (including reproductive health). With men, however, the predicted positive relationship between body attractiveness and health is unlikely to be substantial. The general profile of the most attractive male bodies (involving high chest muscularity in relation to body fat) is known to predict poor health outcomes in a similar manner to profiles involving male bodies that are high in fat without being muscular. If the healthiest male bodies were most attractive, men who are thin (low in fat and muscle) would be most attractive. With respect to male height, we have conflicting evidence both as to whether it affects attractiveness judgments in the first place (as opposed to directly affecting male mate value independently of physical attractiveness judgments) and as to whether it is indicative of better health. For faces, women's face attractiveness does have a small relationship with health (weighted average  $r$  across studies =  $.15$ ), but the relationship is absent among men (weighted average  $r$  across studies =  $.04$ ).

Although there does appear to be a relationship between health and attractiveness in women, a crucial caveat applies: The fact that there is not yet a secure estimate of the size of the relationship with respect to women's bodies, coupled with the fact that the current best estimate of the size of that relationship with regard to women's faces is small ( $r = .15$ ), indicates that discussions declaring that female attractiveness primarily acts as a health certificate are overstated. Further, when men are included, these discussions can

be misleading; the best evidence indicates that male attractiveness is unrelated to health.

### *Summary of Cue-Based Relationships*

The overall relationship between attractiveness and health is typically claimed to exist by virtue of the accumulated effect of the various cues—the cues should predict both attractiveness and health, leading to the direct relationship between attractiveness and health. This claim seems unwarranted with regard to men, however, given that men's attractiveness has not been shown to relate to their health, and therefore there is no relevant relationship present to be accounted for by any set of proposed cues.

The most widely researched specific cues most often fail to predict substantially both attractiveness and health. The clear exceptions, as already noted, are the lower ranges of normal BMI and low WHR in women, both of which predict health (including reproductive health) and attractiveness in essentially the same manner in developed Western societies.

Some of the reviewed cues predict attractiveness in the predicted direction but not health outcomes. These include the following:

1. Men's increased body size from muscularity is associated with higher attractiveness but worse health outcomes.
2. Face averageness in both sexes predicts higher attractiveness, but in the single existing study produced only a small relationship with health outcomes in women and men, with correlations averaging  $.12$  and  $.09$ , respectively.
3. Face femininity in women predicts higher attractiveness, but in the single existing study failed to predict health outcomes ( $r = -.01$ ).
4. Face asymmetry in men has a small but meaningful relationship with men's face attractiveness (weighted average  $r$  across studies =  $-.14$ ) but no relationship with health outcomes (average correlations less than  $.10$  in absolute value in each of the three existing studies).

Other proposed attractiveness–health cues have failed to substantially predict attractiveness in the first place:

1. Body and face symmetry in women. Body symmetry has been studied in relation to women's body attractiveness only rarely and indirectly, without substantial results, and has also failed to substantially predict women's health. Women's face asymmetry has been widely studied and is essentially unrelated to their face attractiveness (weighted average  $r$  across studies =  $-.06$ ) and health (average correlations less than  $.10$  in absolute value in each of the three existing studies).
2. Face masculinity/femininity in men. Men's face masculinity has the unlikely outcome of not typically predicting attractiveness judgments (indeed, the most typical finding has been a preference for male face femininity) but predicting modestly (in a single study) health outcomes ( $r = .17$ ).

The conclusion of evidence is unclear for some other reviewed cues. Men's height shows clear evidence of desirability but conflicting evidence on whether height affects judgments of physical attractiveness and whether it indicates better or worse health. Preferences for different WHR values in men seem to show, first, that WHR is not an important predictor for men's body attractiveness compared with measures of larger size from muscle; second, that women do not prefer protruding waists (which is consistent with health data); but, third, that women prefer moderately high WHRs (in the .9 range) to lower WHRs, which is likely to run against a health-based preference. Finally, men's body FA has been untested with regard to body attractiveness ratings, except in a single line-drawing study, which found a preference for reduced symmetry; and FA's relationship to overall health outcomes is weak, although data suggest that men with lower body FA have higher sperm quality.

On the whole, with regard to the specific proposed cues, then, there is only secure evidence of attractiveness–health links in both sexes in relation to body fat in general and abdominal fat in particular, more so for women than for men. Conversely, some central components of the recent literature have yet to support the links claimed of them.

### *Theoretical Implications*

Though our review has been aimed at a set of simple claims about the state of the empirical literature on health–attractiveness links in developed Western societies, the findings have some relevance to general theories of attractiveness. We break out the possibilities into three different theoretical orientations and describe the relevance of our review, as well as point to additional categories of evidence not reviewed here that would seem key to evaluating these different perspectives. In evaluating the relevance of our review for different general theoretical orientations to attractiveness, it is important to stress the difference between the relevance of positive and null health–attractiveness findings. Some theories may predict one or the other, while others will not make a prediction one way or the other. Of course, the crucial tests of any theory are not its confirmations, but its disconfirmations.

### *Theories of Fitness-Irrelevant Origins of Attractiveness Judgments*

Some theories claim that attractiveness preferences are based on cultural or developmental processes that are unrelated to health or fitness or are otherwise essentially arbitrary. From our review, it appears that the status of women's body attractiveness provides disconfirming evidence of such claims—women's body attractiveness is strongly determined by characteristics that have known substantial positive relationships with health (including reproductive health) in developed Western societies. Women's face attractiveness also relates positively to their health, which may in part be related to perceptions of weight from faces, given the presence of substantial relationships between women's BMI and face attractiveness.

### *Evolutionary Theories of Ancestrally Constrained Attractiveness Judgments*

Evolutionary psychological theories of physical attractiveness judgments often state that the bases of those judgments are *ances-*

*trally constrained*. That is, a certain set of criteria for judging attractiveness will reliably appear in normally developing men and women, and those criteria relate to cues that correlated positively with fitness in ancestral environments. The resulting criteria might be posited as gender-specific universals across and within cultures or as contingency driven. The contingency-driven ancestrally constrained view holds that there may have been ranges of variation that appeared within ancestral environments that caused differing cue–fitness relationships, such that what evolved were if-then developmental routines or decision rules that cause individuals with a given set of surrounding circumstances to use one set of attractiveness criteria while causing individuals with different surrounding circumstances to use a different set of attractiveness criteria. What makes the criteria in either case ancestrally constrained is the theory that the resulting attractiveness cues were the cues that tracked fitness-relevant information in the variable ancestral environments. People who today live among circumstances that track a given set of relevant aspects of ancestral environments use the attractiveness criteria that would have correlated with higher fitness in those ancestral environments. People who today live among circumstances that track a different set of relevant aspects of ancestral environments use a different set of attractiveness criteria that would have correlated with higher fitness in ancestral environments with those different aspects.

Layered onto such theories is another dimension we mentioned earlier—namely, conflicting views on the extent to which health outcomes are relevant to determining fitness outcomes. One may believe that current attractiveness cues track ancestral correlates of fitness but believe (for one or both sexes) that health outcomes do not strongly determine fitness outcomes within normally varying populations of potentially reproducing adults. In particular, we mentioned above evolutionary discussions that have stressed that male reproductive success in particular may not be (or may not have been ancestrally) highly tied into male longevity (beyond the life span needed for reaching reproductive adulthood).

As we stressed earlier, our review cannot provide disconfirming evidence for theories that limit their predictions to relationships existing in ancestral environments. And our review also cannot provide disconfirming evidence for evolutionary theories that view normal variations in adult health as having a potentially null relationship with fitness. A positive relationship between attractiveness and health may not be unexpected for ancestrally constrained evolutionary theories of attractiveness, especially for women, but null results from developed Western societies will not disprove them.

However, there is potential evidence that would disprove different versions of ancestrally constrained evolutionary theories, though we have not reviewed that evidence here (to the extent it may exist). For theories positing universal preference sets, disconfirming evidence would come from studies showing substantial cross-culture or within-culture differences in the bases of attractiveness judgments. For theories positing contingency-driven but ancestrally constrained preference sets, disconfirming evidence would come from studies demonstrating the existence of substantial, historically novel attractiveness cues. It is commonly thought that the strong preference in developed Western societies for low BMI in women's bodies meets both the nonuniversal and historically novel criteria; demonstrating such a claim would involve a thorough review of cross-cultural ethnographies and cross-

historical accounts. Further disconfirming evidence for ancestrally constrained evolutionary views of attractiveness would come from studies that showed a lack of relationship between widely shared attractiveness cues and fitness or health in societies that are sufficiently similar to ancestral societies. Again, this is a literature we have not attempted to review.

Although our review has not covered the evidence most directly relevant to the central thrust of evolutionary views proposing ancestrally constrained attractiveness judgments, it should still be of interest to some evolutionary theorists in certain aspects. A key example is with respect to the notion that perceptions of symmetry play a key role in attractiveness judgments because of their current or ancestral links to health. With respect to measurable face symmetry in developed Western societies, our conclusion is that there is little reliable basis on which to claim positive health–symmetry relationships or even positive attractiveness–symmetry relationships for women’s faces. Such conclusions do not speak to the possibility that later studies or a more fine-tuned review of symmetry studies may discover solidly identifiable relationships between more reliable measures of FA and more reliable measures of specific health-relevant outcomes. They only speak to the current state of the evidence, generally considered.

#### *Evolutionary Views of Nonconstrained Attractiveness Judgments*

The most widely discussed evolutionary psychological theories posit ancestrally constrained models, not just for attractiveness but more generally. However, there is no necessary connection between (a) beliefs in the relevance of evolutionary theory to understanding genetic evolution and beliefs in the importance of genetic effects in human development and (b) beliefs that our genes set up developmental processes with ancestrally defined outcomes, even with multiple sets of contingently arising ancestrally defined outcomes. For example, evolution might have given us genes that lead us to attempt to learn what cues in our environments are associated with health, status, reproductive success, or other potentially fitness-relevant areas and then to find those cues attractive. Contemporary Western data are directly relevant to this conception of how evolution worked. This notion is rarely expressed explicitly in the literature, however, perhaps because it strikes investigators as implausible or because those who operate implicitly under notions of such open-ended possibilities do not often puzzle over developmental mechanisms. Such a theory would be limited to the kinds of information that could be learned by individuals over their younger lives and limited personal experience.

To the extent a theory of attractiveness posits such nonconstrained but fitness-relevant developmental paths and also views normal variations in adult health as important to variations in fitness, a lack of male attractiveness–health links in developed Western societies might be disconfirming. Our conclusions are not disconfirming, however, to a theory that includes nonconstrained but fitness-relevant developmental paths and also holds that health status is more closely tied to female fitness than to male fitness. There is a problem, however, in disproving a theory that holds only that fitness-relevant cues lead to increased attractiveness within a given society because it can tend to be circular, reducing to the prediction that people will be attracted to people to whom others are attracted. It is therefore difficult to know what to make of

potential evidence that attractive people have more reproductive opportunities or more offspring without specifying in greater detail the noncircular mechanisms involved.

At least two categories of findings not included in our review would be potentially disconfirming to nonconstrained but fitness-relevant theories. First, it could be the case that there exist cues that (a) predict health or fitness outcomes in ancestral-related environments and (b) do not predict health or fitness outcomes in modern environments but (c) are nonetheless found attractive in modern environments. Again, we have not attempted to review ancestral-related evidence, but the possible list of cues that we have reviewed that might serve such a function with respect to health outcomes (i.e., contemporary cues that are found attractive but do not relate to health) include men’s body muscularity and men’s face symmetry and might also include face averageness and women’s face femininity (though more work is needed to reliably determine whether these cues in fact do not predict health in modern environments, given that in each case the null conclusion is based on a single study).

A related second category of potentially disconfirming evidence would look for reliably perceivable cues that relate to worse health or fitness outcomes in modern environments and then show that such cues do not relate to attractive judgments. Although we have not performed here a bottom-up search for potential health-based cues outside of the attractiveness literature, two items from our review might fit here: men’s facial masculinity, which seems not to be preferred but in a single study modestly predicted men’s health, and men’s having thin (but not too thin) bodies, which is healthy and preferred to men’s having fat bodies but not to their having muscular bodies. Again, however, such data would not disconfirm a theory relating modern attractiveness judgments to modern fitness if it were the case that modern male fitness is not closely related to male health.

#### *Combined Perspectives*

We have laid out the theoretical perspectives above as separate ideas, but of course the truth may be that our ultimate sets of attractiveness criteria involve combinations of these notions (and others). Some bases of attractiveness judgments may be reliably developing and universal, based on widely shared ancestral fitness correlates. Some may be reliably developing as a result of non-fitness-relevant developmental biases that are by-products of other selection-driven processes. Some may be reliably developing given the presence of certain environmental triggers based on environmentally contingent ancestral fitness correlates. Some may derive from more open-ended learning mechanisms that attempt to discern the bases of various fitness-relevant local outcomes. Some may begin as relatively universal developmental biases or perhaps as results of simple social imitation but then be later modified by experiential data gathering. Some may be fundamentally arbitrary and survive locally through processes involving in-group ethnic demarcation, runaway sexual selection, or other processes. Given such possibilities, it is important to recognize that “disconfirming” evidence with respect to a given theory and a given cue relates only to that theory and that cue. Our review is not sufficient by itself to attempt a final word on these complex possibilities, though we have noted where we think its relevance comes into play.

## References

- Al-Eisa, E., Egan, D., & Wassersug, R. (2004). Fluctuating asymmetry and low back pain. *Evolution and Human Behavior*, 25, 31–37.
- Barker, D. J. P., Osmond, C., & Golding, J. (1990). Height and mortality in the counties of England and Wales. *Annals of Human Biology*, 17, 1–6.
- Beck, S. B., Ward-Hull, C. I., & McLearn, P. M. (1976). Variables related to women's somatic preferences of the male and female body. *Journal of Personality and Social Psychology*, 34, 1200–1210.
- Bjorntorp, P. (1988). The association between obesity, adipose tissue distribution and disease. *Acta Medica Scandinavica(Supplementum)*, 723, 121–134.
- Bjorntorp, P. (1991). Adipose tissue distribution and function. *International Journal of Obesity*, 15, 67–68.
- Brown, W. M., & Moore, C. (2003). Fluctuating asymmetry and romantic jealousy. *Evolution and Human Behavior*, 24, 113–117.
- Bulik, C. M., Sullivan, P. F., Pickering, A., Dawn, A., & McCullian, M. (1999). Fertility and reproduction in women with anorexia nervosa: A controlled study. *Journal of Clinical Psychiatry*, 60, 130–135.
- Buss, D. M. (1994). *The evolution of desire*. New York: Basic Books.
- Carter, J. E. L., & Heath, B. H. (1990). *Somatotyping: Development and applications*. Cambridge, England: Cambridge University Press.
- Cash, T. F., & Hicks, K. L. (1990). Being fat versus thinking fat: Relationships with body image, eating behaviors, and well-being. *Cognitive Therapy and Research*, 14, 327–341.
- Damon, A., Damon, S., Harpending, H. C., & Kannel, W. B. (1969). Predicting coronary heart disease from body measurements of Framingham males. *Journal of Chronic Diseases*, 21, 781–802.
- Davis, C., Shuster, B., Dionne, M., & Claridge, G. (2001). Do you see what I see? Facial attractiveness and weight preoccupation in college women. *Journal of Social and Clinical Psychology*, 20, 147–160.
- DeRidder, C. M., Bruning, P. F., Zonderland, M. L., Thijssen, J. H. H., Bonfrer, J. M. G., Blankenstein, M. A., et al. (1990). Body fat mass, fat distribution, and plasma hormones in early puberty in females. *Journal of Clinical Endocrinology and Metabolism*, 70, 888–893.
- De Souza, M. J., & Metzger, D. A. (1991). Reproductive dysfunction in amenorrheic athletes and anorexic patients: A review. *Medicine and Science in Sports and Exercise*, 23, 995–1007.
- Deter, H. C., & Herzog, W. (1994). Anorexia nervosa in a long-term perspective: Results of the Heidelberg-Mannheim study. *Psychosomatic Medicine*, 56, 20–27.
- DiBennardo, R., & Bailit, H. L. (1978). Stress and dental asymmetry in a population of Japanese children. *American Journal of Physical Anthropology*, 48, 89–94.
- Dixon, A. F., Halliwell, G., East, R., Wignarajah, P., & Anderson, M. J. (2003). Masculine somatotype and hirsuteness as determinants of sexual attractiveness to women. *Archives of Sexual Behavior*, 32, 29–39.
- Ellis, H. (1926). *Studies in the psychology of sex* (Vol. 4). Philadelphia: Davis.
- Evans, D. J., Barth, J. H., & Burke, C. W. (1988). Body fat topography in women with androgen excess. *International Journal of Obesity*, 12, 157–162.
- Fan, J., Liu, F., Wu, J., & Dai, W. (2004). Visual perception of female physical attractiveness. *Proceedings of the Royal Society of London B*, 271, 347–352.
- Feingold, A. (1992). Good-looking people are not what we think. *Psychological Bulletin*, 111, 304–341.
- Fink, B., Grammer, K., & Thornhill, R. (2001). Human (*Homo sapiens*) facial attractiveness in relation to skin texture and color. *Journal of Comparative Psychology*, 115, 92–99.
- Fink, B., Manning, J. T., Neave, N., & Grammer, K. (2004). Second to fourth digit ratio and facial asymmetry. *Evolution and Human Behavior*, 25, 125–132.
- Firman, R. C., Simmons, L. W., Cummins, J. M., & Matson, P. L. (2003). Are body fluctuating asymmetry and the ratio of 2nd to 4th digit length reliable predictors of semen quality? *Human Reproduction*, 18, 808–812.
- Folsom, A. R., Kaye, S. A., Sellers, T. A., Hong, C. P., Cerhan, J. R., Potter, J. D., & Prineas, R. J. (1993). Body fat distribution and 5-year risk of death in older women. *Journal of the American Medical Association*, 269, 483–487.
- Forestell, C. A., Humphrey, T. M., & Stewart, S. H. (2004). Involvement of body weight and shape factors in ratings of attractiveness by women: A replication and extension of Tassinari and Hansen (1998). *Personality and Individual Differences*, 36, 295–305.
- Franzoi, S. L., & Herzog, M. E. (1987). Judging physical attractiveness: What bodily aspects do we use? *Personality and Social Psychology Bulletin*, 13, 19–33.
- Furnham, A., Moutafi, J., & Baguma, P. (2002). A cross-cultural study on the role of weight and waist-to-hip ratio on female attractiveness. *Personality and Individual Differences*, 32, 729–745.
- Furnham, A., Tan, T., & McManus, C. (1997). Waist-to-hip ratio and preferences for body shape: A replication and extension. *Personality and Individual Differences*, 22, 539–549.
- Galton, F. (1879). Composite portraits, made by combining those of many different persons in a single resultant figure. *Journal of the Anthropological Institute*, 8, 132–144.
- Gangestad, S. W., & Thornhill, R. (1997). Human sexual selection and developmental stability. In J. A. Simpson & D. T. Kenrick (Eds.), *Evolutionary social psychology* (pp. 169–195). Mahwah, NJ: Erlbaum.
- Geary, D. C., Vigil, J., & Byrd-Craven, J. (2004). Evolution of human mate choice. *Journal of Sex Research*, 41, 27–42.
- Gertler, M. M., & White, P. D. (1954). *Coronary heart disease in young adults: A multidisciplinary study*. Cambridge, MA: Harvard University Press.
- Getty, T. (2002). Signaling health versus parasites. *American Naturalist*, 159, 363–371.
- Gilmore, J. (1999). Body mass index and health. *Health Reports*, 11, 31–43.
- Gitter, A. G., Lomranz, J., & Saxe, L. (1982). Factors affecting perceived attractiveness of male physiques by American and Israeli students. *Journal of Social Psychology*, 118, 167–175.
- Grammer, K., Fink, B., Moller, A. P., & Thornhill, R. (2003). Darwinian aesthetics: Sexual selection and the biology of beauty. *Biological Reviews*, 78, 385–407.
- Grammer, K., & Thornhill, R. (1994). Human (*Homo sapiens*) facial attractiveness and sexual selection: The role of symmetry and averageness. *Journal of Comparative Psychology*, 108, 233–242.
- Gunnell, D., May, M., Ben-Shlomo, Y., Yarnell, J., & Smith, G. D. (2003). Height, leg length, and cancer: The Caerphilly Study. *Nutrition and Cancer*, 47, 34–39.
- Henderson, J. J. A., & Anglin, J. M. (2003). Facial attractiveness predicts longevity. *Evolution and Human Behavior*, 24, 351–356.
- Henss, R. (1995). Waist-to-hip ratio and attractiveness: Replication and extension. *Personality and Individual Differences*, 19, 479–488.
- Henss, R. (2000). Waist-to-hip and female attractiveness: Evidence from photographic stimuli and methodological considerations. *Personality and Individual Differences*, 28, 501–513.
- Herbert, P. R., Rich-Edwards, J. W., Manson, J. E., Ridker, P. M., Cook, N. R., O'Connor, G. T., et al. (1993). Height and incidence of cardiovascular disease in male physicians. *Circulation*, 88, 1437–1443.
- Hovarth, T. (1981). Physical attractiveness: The influence of selected torso parameters. *Archives of Sexual Behavior*, 10, 21–24.
- Hume, D. K., & Montgomerie, R. (2001). Facial attractiveness signals different aspects of "quality" in women and men. *Evolution and Human Behavior*, 22, 93–112.
- Jasienska, G., Ziomkiewicz, A., Ellison, P. T., Lipson, S. F., & Thune, I. (2004). Large breasts and narrow waists indicate high reproductive



- potential in women. *Proceedings of the Royal Society of London B*, 271, 1213–1217.
- Johnston, V. S., Hagel, R., Franklin, M., Fink, B., & Grammer, K. (2001). Male facial attractiveness: Evidence for hormone-mediated adaptive design. *Evolution and Human Behavior*, 22, 251–267.
- Jones, B. C., Little, A. C., Feinberg, D. R., Penton-Voak, I. S., Tiddeman, B. P., & Perrett, D. I. (2004). The relationship between shape symmetry and perceived skin condition in male facial attractiveness. *Evolution and Human Behavior*, 25, 24–30.
- Jones, B. C., Little, A. C., Penton-Voak, I. S., Tiddeman, B. P., Burt, D. M., & Perrett, D. I. (2001). Facial symmetry and judgments of apparent health: Support for a “good genes” explanation of the attractiveness-symmetry relationship. *Evolution and Human Behavior*, 22, 417–429.
- Jones, D., & Hill, K. (1993). Criteria of facial attractiveness in five populations. *Human Nature*, 4, 271–296.
- Kalick, S. M., Zebrowitz, L. A., Langlois, J. H., & Johnson, R. M. (1998). Does human facial attractiveness honestly advertise health? Longitudinal data on an evolutionary question. *Psychological Science*, 9, 8–13.
- Kee, F., Nicaud, V., Tiret, L., Evans, A., O’Reilly, D., & DeBaker, G. (1997). Short stature and heart disease: Nature or nurture. *International Journal of Epidemiology*, 26, 748–756.
- Koehler, N., Rhodes, G., & Simmons, L. W. (2002). Are human female preferences for symmetrical male faces enhanced when conception is likely? *Animal Behaviour*, 64, 233–238.
- Koehler, N., Simmons, L. W., Rhodes, G., & Peters, M. (2004). The relationship between sexual dimorphism in human faces and fluctuating asymmetry. *Proceedings of the Royal Society of London B*, 271(Biology Letters Suppl. 5), S233–S236.
- Kokko, H., Brooks, R., McNamara, J. M., & Houston, A. I. (2002). The sexual selection continuum. *Proceedings of the Royal Society of London B*, 269, 1331–1340.
- Kowner, R. (1996). Facial asymmetry and attractiveness judgment in developmental perspective. *Journal of Experimental Psychology: Human Perception and Performance*, 22, 662–675.
- Krahn, A. D., Manfreda, J., Tate, R. B., Mathewson, F. A., & Cuddy, T. E. (1994). Evidence that height is an independent risk factor for coronary artery disease (the Manitoba Follow-Up Study). *American Journal of Cardiology*, 74, 398–399.
- Langlois, J. H., Kalakanis, L., Rubenstein, A. J., Larson, A., Hallam, M., & Smoot, M. (2000). Maxims or myths of beauty? A meta-analytic and theoretical review. *Psychological Bulletin*, 126, 390–423.
- Langlois, J. H., & Roggman, L. A. (1990). Attractive faces are only average. *Psychological Science*, 1, 115–121.
- Little, A. C., Burt, D. M., Penton-Voak, I. S., & Perrett, D. I. (2001). Self-perceived attractiveness influences human female preferences for sexual dimorphism and symmetry in male faces. *Proceedings of the Royal Society of London B*, 268, 39–44.
- Little, A. C., & Hancock, P. J. B. (2002). The role of masculinity and distinctiveness in judgments of human male facial attractiveness. *British Journal of Psychology*, 93, 451–464.
- Little, A. C., & Jones, B. C. (2003). Evidence against perceptual bias views for symmetry preferences in human faces. *Proceedings of the Royal Society of London B*, 270, 1759–1763.
- Little, A. C., Jones, B. C., Penton-Voak, I. S., Burt, D. M., & Perrett, D. I. (2002). Partnership status and the temporal context of relationships influences human female preferences for sexual dimorphism in male face shape. *Proceedings of the Royal Society of London B*, 269, 1095–1100.
- Livshits, G., Davidi, L., Kobyliansky, E., Ben-Amital, D., Levi, Y., & Merlob, P. (1988). Decreased developmental stability as assessed by fluctuating asymmetry of morphometric traits in preterm infants. *American Journal of Medical Genetics*, 29, 793–805.
- Livshits, G., & Kobyliansky, E. (1991). Fluctuating asymmetry as a possible measure of developmental homeostasis in humans: A review. *Human Biology*, 63, 441–466.
- Lynn, M., & Shurgot, B. A. (1984). Responses to lonely hearts advertisements: Effects of reported physical attractiveness, physique, and coloration. *Personality and Social Psychology Bulletin*, 10, 349–357.
- Macintyre, S., & West, P. (1991). Social, developmental and health correlates of “attractiveness” in adolescence. *Sociology of Health and Illness*, 13, 149–167.
- Maisey, D. S., Vale, E. L. E., Cornelissen, P. L., & Tovee, M. J. (1999, May 1). Characteristics of male attractiveness for women. *Lancet*, 353, 1500.
- Malina, R. M., Katzmarzyk, P. T., Song, T. M. K., Theriault, G., & Bouchard, C. (1997). Somatotype and cardiovascular risk factors in healthy adults. *American Journal of Human Biology*, 9, 11–19.
- Manning, J. T., Koukourakis, K., & Brodie, D. A. (1997). Fluctuating asymmetry, metabolic rate and sexual selection in human males. *Evolution and Human Behavior*, 18, 15–21.
- Manning, J. T., Scutt, D., & Lewis-Jones, D. I. (1998). Developmental stability, ejaculate size, and sperm quality in men. *Evolution and Human Behavior*, 19, 273–282.
- Manson, J. E., Willett, W. C., Stampfer, M. J., Colditz, G. A., Hunter, D. J., Hankinson, S. E., et al. (1995). Body weight and mortality among women. *New England Journal of Medicine*, 333, 677–685.
- McCreary, D. R., & Sadava, S. W. (2001). Gender differences in relationships among perceived attractiveness, life satisfaction, and health in adults as a function of body mass index and perceived weight. *Psychology of Men and Masculinity*, 2, 108–116.
- Mealey, L., Bridgstock, R., & Townsend, G. C. (1999). Symmetry and perceived facial attractiveness: A monozygotic co-twin comparison. *Journal of Personality and Social Psychology*, 76, 151–158.
- Michaud, D. S., Giovannucci, E., Willett, W. C., Colditz, G. A., Stampfer, M. J., & Fuchs, C. S. (2001). Physical activity, obesity, height, and the risk of pancreatic cancer. *Journal of the American Medical Association*, 286, 921–929.
- Miller, G. (2000). *The mating mind*. New York: Doubleday.
- Miller, G. F., & Todd, P. M. (1998). Mate choice turn cognitive. *Trends in Cognitive Sciences*, 2, 190–198.
- Milligan, R. A. K., Burke, V., Dunbar, D. L., Spencer, M., Balde, E., Berlin, L. J., & Gracey, M. P. (1997). Associations between lifestyle and cardiovascular risk factors in 18-year-old Australians. *Journal of Adolescent Health*, 21, 186–195.
- Milne, B. J., Belsky, J., Poulton, R., Thompson, W. M., Caspi, A., & Kieser, J. (2003). Fluctuating asymmetry and physical health among young adults. *Evolution and Human Behavior*, 24, 53–63.
- Morris, P. E., & Wickham, L. H. V. (2001). Typicality and face recognition: A critical re-evaluation of the two factor theory. *Quarterly Journal of Experimental Psychology: Human Experimental Psychology*, 54(A), 863–877.
- Mueller, U., & Mazur, A. (2001). Evidence of unconstrained directional selection for male tallness. *Behavioral Ecology and Sociobiology*, 50, 302–311.
- Must, A., Spadano, J., Coakly, E. H., Field, A. E., Colditz, G., & Dietz, W. H. (1999). The disease burden associated with overweight and obesity. *Journal of the American Medical Association*, 282, 1523–1529.
- National Heart, Lung, and Blood Institute. (1998). *Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: The evidence report* (NIH Publication No. 98–4083). Bethesda, MD: National Institutes of Health.
- Nettle, D. (2002a). Height and reproductive success in a cohort of British men. *Human Nature*, 13, 473–491.
- Nettle, D. (2002b). Women’s height, reproductive success and the evolution of sexual dimorphism in modern humans. *Proceedings of the Royal Society of London B*, 269, 1919–1923.
- Noor, F., & Evans, D. C. (2003). The effect of facial symmetry on

- perceptions of personality and attractiveness. *Journal of Research in Personality*, 37, 339–347.
- Parsons, P. A. (1990). Fluctuating asymmetry: An epigenetic measure of stress. *Biological Reviews*, 65, 131–145.
- Parsons, P. A. (1992). Fluctuating asymmetry: A biological monitor of environmental and genomic stress. *Heredity*, 68, 361–364.
- Paul, O., Lepper, M. H., Phelan, W. H., Dupertius, G. W., MacMillan, A., McKean, H., & Park, H. (1963). A longitudinal study of coronary heart disease. *Circulation*, 28, 20–31.
- Pawlowski, B. (2003). Variable preference for sexual dimorphism in height as a strategy for increasing the pool of potential partners in humans. *Proceedings of the Royal Society of London B*, 270, 709–712.
- Pawlowski, B., Dunbar, R. I. M., & Lipowicz, A. (2000, January 13). Tall men have more reproductive success. *Nature*, 403, 156.
- Pawlowski, B., & Koziel, S. (2002). The impact of traits offered in personal advertisements on response rates. *Evolution and Human Behavior*, 23, 139–149.
- Peck, A. M., & Vagero, D. H. (1989). Adult body height, self-perceived health and mortality in the Swedish population. *Epidemiology and Community Health*, 43, 380–384.
- Penton-Voak, I. S., Jones, B. C., Little, A. C., Baker, S., Tiddeman, B., Burt, D. M., & Perrett, D. I. (2001). Symmetry, sexual dimorphism in facial proportions and male facial attractiveness. *Proceedings of the Royal Society of London B*, 268, 1617–1623.
- Penton-Voak, I. S., Little, A. C., Jones, B. C., Burt, D. M., Tiddeman, B. P., & Perrett, D. I. (2003). Female condition influences preferences for sexual dimorphism in faces of male humans (*Homo sapiens*). *Journal of Comparative Psychology*, 117, 264–271.
- Perrett, D. I., Burt, D. M., Penton-Voak, I. S., Lee, K. J., Rowland, D. A., & Edwards, R. (1999). Symmetry and human facial attractiveness. *Evolution and Human Behavior*, 20, 295–307.
- Perrett, D. I., Lee, K. J., Penton-Voak, I. S., Rowland, D., Yoshikawa, S., Burt, D. M., et al. (1998, August 27). Effects of sexual dimorphism on facial attractiveness. *Nature*, 394, 884–887.
- Pi-Sunyer, F. X. (1993). Medical hazards of obesity. *Annals of Internal Medicine*, 119, 655–660.
- Puhl, R. M., & Boland, F. J. (2001). Predicting female physical attractiveness: Waist-to-hip ratio versus thinness. *Psychology, Evolution and Gender*, 3, 27–46.
- Rebuffe-Scrive, M. (1991). Neuroregulation of adipose tissue: Molecular and hormonal mechanisms. *International Journal of Obesity*, 15, 83–86.
- Rhodes, G., Chan, J., Zebrowitz, L. A., & Simmons, L. W. (2003). Does sexual dimorphism in human faces signal health? *Proceedings of the Royal Society of London B*(Suppl. 1), 270, S93–S95.
- Rhodes, G., Hickford, C., & Jeffery, L. (2000). Sex-typicality and attractiveness: Are supermale and superfemale faces super-attractive? *British Journal of Psychology*, 91, 125–140.
- Rhodes, G., Proffitt, F., Grady, J. M., & Sumich, A. (1998). Facial symmetry and the perception of beauty. *Psychonomic Bulletin & Review*, 5, 659–669.
- Rhodes, G., Roberts, J., & Simmons, L. W. (1999). Reflections on symmetry and attractiveness. *Psychology, Evolution and Gender*, 1, 279–295.
- Rhodes, G., Sumich, A., & Bryatt, G. (1999). Are average facial configurations attractive only because of their symmetry? *Psychological Science*, 10, 52–58.
- Rhodes, G., & Tremewan, T. (1996). Averageness, exaggeration, and facial attractiveness. *Psychological Science*, 7, 105–110.
- Rhodes, G., Yoshikawa, S., Clark, A., Lee, K., McKay, R., & Akamatsu, S. (2001). Attractiveness of facial averageness and symmetry in non-Western cultures: In search of biologically based standards of beauty. *Perception*, 30, 611–625.
- Rhodes, G., Zebrowitz, L. A., Clark, A., Kalick, S. M., Hightower, A., & McKay, R. (2001). Do facial averageness and symmetry signal health? *Evolution and Human Behavior*, 22, 31–46.
- Rikowski, A., & Grammer, K. (1999). Human body odour, symmetry and attractiveness. *Proceedings of the Royal Society of London B*, 266, 869–874.
- Salusso-Deonier, C. J., Markee, N. L., & Pedersen, E. L. (1993). Gender differences in the evaluation of physical attractiveness ideals for male and female body builds. *Perceptual & Motor Skills*, 76, 1155–1167.
- Samaras, T. T., Elrick, H., & Storms, L. H. (1999). Is attainment of greater height and body size really desirable? *Journal of the National Medical Association*, 91, 317–321.
- Samaras, T. T., & Storms, L. H. (1992). Impact of height and weight on life span. *Bulletin of the World Health Organization*, 70, 259–267.
- Sarwer, D. B., Grossbart, T. A., & Didie, E. R. (2003). Beauty and society. *Seminars in Cutaneous Medicine and Surgery*, 22, 79–92.
- Scheib, J. E., Gangestad, S. W., & Thornhill, R. (1999). Facial attractiveness, symmetry and cues of good genes. *Proceedings of the Royal Society of London B*, 266, 1913–1917.
- Scutt, D., Manning, J. T., Whitehouse, G. H., Leinster, S. J., & Massey, C. P. (1997). The relationship between breast asymmetry, breast size and the occurrence of breast cancer. *British Journal of Radiology*, 70, 1017–1021.
- Shackelford, T. K., & Larsen, R. J. (1997). Facial asymmetry as an indicator of psychological, emotional, and physiological distress. *Journal of Personality and Social Psychology*, 72, 456–466.
- Shackelford, T. K., & Larsen, R. J. (1999). Facial attractiveness and physical health. *Evolution and Human Behavior*, 20, 71–76.
- Sheldon, W. H., Dupertuis, C. W., & McDermott, E. (1954). *Atlas of men*. New York: Harper.
- Sheldon, W. H., Stevens, S. S., & Tucker, W. B. (1940). *The varieties of human physique*. New York: Harper.
- Sheppard, J. A., & Strathman, A. J. (1989). Attractiveness and height: The role of stature in dating preference, frequency of dating, and perceptions of attractiveness. *Personality and Social Psychology Bulletin*, 15, 617–627.
- Shors, A. R., Solomon, C., McTiernan, A., & White, E. (2001). Melanoma risk in relation to height, weight, and exercise (United States). *Cancer Causes and Control*, 12, 599–606.
- Silventoinen, K., Lahekma, E., & Rahkonen, O. (1999). Social background, adult body-height and health. *International Journal of Epidemiology*, 28, 911–918.
- Simmons, L. W., Rhodes, G., Peters, M., & Koehler, N. (2004). Are human preferences for facial symmetry focused on signals of developmental instability? *Behavioral Ecology*, 15, 864–871.
- Singh, D. (1993a). Adaptive significance of female physical attractiveness: The role of waist-to-hip ratio. *Journal of Personality and Social Psychology*, 65, 293–307.
- Singh, D. (1993b). Body shape and women's attractiveness: The critical role of waist-to-hip ratio. *Human Nature*, 4, 297–321.
- Singh, D. (1994a). Body fat distribution and perception of desirable female body shape by young Black men and women. *International Journal of Eating Disorders*, 16, 289–294.
- Singh, D. (1994b). Is thin really beautiful and good? Relationship between waist-to-hip ratio (WHR) and female attractiveness. *Personality and Individual Differences*, 16, 123–132.
- Singh, D. (1995a). Female health, attractiveness, and desirability for relationships: Role of breast asymmetry and waist-to-hip ratio. *Ethology and Sociobiology*, 16, 465–485.
- Singh, D. (1995b). Female judgment of male attractiveness and desirability for relationships: Role of waist-to-hip ratio. *Journal of Personality and Social Psychology*, 69, 1089–1101.
- Singh, D. (2004). Mating strategies of young women: Role of physical attractiveness. *Journal of Sex Research*, 41, 43–54.
- Smit, P. J., Daehne, H. O., Halhuber, M. H., & Stocksmeier, U. (1979).

- Somatotypes of cardiac infarction patients. In P. J. Smit (Ed.), *Sport and somatology in ischaemic heart disease* (pp. 1–14). Pretoria, South Africa: University of Pretoria.
- Soler, C., Nunez, M., Gutierrez, R., Nunez, J., Medina, P., Sancho, M., et al. (2003). Facial attractiveness in men provides clues to semen quality. *Evolution and Human Behavior, 24*, 199–207.
- Spain, D. M., Nathan, D. J., & Gellis, M. (1963). Weight, body type and the prevalence of coronary atherosclerotic heart disease in males. *American Journal of Medical Science, 245*, 63–69.
- Streeter, S. A., & McBurney, D. H. (2003). Waist-to-hip ratio and attractiveness: New evidence and a critique of “a critical test.” *Evolution and Human Behavior, 24*, 88–98.
- Swaddle, J. P., & Cuthill, I. C. (1995). Asymmetry and human facial attractiveness: Symmetry may not always be beautiful. *Proceedings of the Royal Society of London B, 261*, 111–116.
- Swaddle, J. P., & Reiersen, G. W. (2002). Testosterone increases perceived dominance but not attractiveness in human males. *Proceedings of the Royal Society of London B, 269*, 2285–2289.
- Symons, D. (1979). *The evolution of human sexuality*. Oxford, England: Oxford University Press.
- Symons, D. (1995). Beauty is in the adaptations of the beholder: The evolutionary psychology of human female sexual attractiveness. In P. R. Abramson & S. D. Pinkerton (Eds.), *Sexual nature, sexual culture* (pp. 80–118). Chicago: University of Chicago Press.
- Tassinary, L. G., & Hansen, K. A. (1998). A critical test of the waist-to-hip-ratio hypothesis of female physical attractiveness. *Psychological Science, 9*, 150–155.
- Thornhill, R., & Gangestad, S. W. (1996). The evolution of human sexuality. *Trends in Ecology & Evolution, 11*, 98–102.
- Thornhill, R., & Gangestad, S. W. (1999). Facial attractiveness. *Trends in Cognitive Sciences, 3*, 452–460.
- Thornhill, R., & Grammer, K. (1999). The body and face of a woman: One ornament that signals quality? *Evolution and Human Behavior, 20*, 105–120.
- Thornhill, R., & Moller, A. P. (1997). Developmental stability, disease and medicine. *Biological Reviews, 72*, 497–548.
- Tomkinson, G. R., & Olds, T. S. (2000). Physiological correlates of bilateral symmetry in humans. *International Journal of Sports Medicine, 21*, 545–550.
- Tovee, M. J., Benson, P. J., Emery, J. L., Mason, S. M., & Cohen-Tovee, E. M. (2003). Measurement of body size and shape perception in eating-disordered and control observers using body-shape software. *British Journal of Psychology, 94*, 501–516.
- Tovee, M. J., & Cornelissen, P. L. (2001). Female and male perceptions of female physical attractiveness in front-view and profile. *British Journal of Psychology, 92*, 391–402.
- Tovee, M. J., Hancock, P. J. B., Mahmoodi, S., Singleton, B. R. R., & Cornelissen, P. L. (2002). Human female attractiveness: Waveform analysis of body shape. *Proceedings of the Royal Society of London B, 269*, 2205–2213.
- Tovee, M. J., Maisey, D. S., Emery, J. L., & Cornelissen, P. L. (1999). Visual cues to female physical attractiveness. *Proceedings of the Royal Society of London B, 266*, 211–218.
- Tovee, M. J., Mason, S. M., Emery, J. L., McCluskey, S. E., & Cohen-Tovee, E. M. (1997, November 15). Supermodels: Stick insects or hourglasses? *Lancet, 350*, 1474–1475.
- Tovee, M. J., Reinhardt, S., Emery, J. L., & Cornelissen, P. L. (1998, August 15). Optimal body-mass index and maximum sexual attractiveness. *Lancet, 352*, 548.
- Tovee, M. J., Tasker, K., & Benson, P. J. (2000). Is symmetry a visual cue to attractiveness in the human female body? *Evolution and Human Behavior, 21*, 191–200.
- Waal, H. T. (1984). Height, weight and mortality. The Norwegian experience. *Acta Medica Scandinavica, Supplementum, 679*, 1–56.
- Walker, M., Shaper, A. G., Phillips, A. N., & Cook, D. G. (1989). Short stature, lung function and risk of a heart attack. *International Journal of Epidemiology, 12*, 602–606.
- Wannamethee, S. G., Shaper, A. G., Whincup, P. H., & Walker, M. (1998). Adult height, stroke, and coronary heart disease. *American Journal of Epidemiology, 148*, 1069–1076.
- Wass, P., Waldenstrom, U., Rossner, S., & Hellberg, D. (1997). An android body fat distribution in females impairs the pregnancy rate of in-vitro fertilization-embryo transfer. *Human Reproduction, 12*, 2057–2060.
- Westermark, E. A. (1921). *The history of human marriage* (5th ed.). London: MacMillan.
- Willet, W. C., Manson, J. E., Stampfer, M. J., Colditz, G. A., Rosner, B., Speizer, F. E., & Hennekens, C. H. (1995). Weight, weight changes and coronary heart disease in women: Risk within the “normal” weight range. *Journal of the American Medical Association, 273*, 461–465.
- Williams, S. R. P., Goodfellow, J., Davies, B., Bell, W., McDowell, I., & Jones, E. (2000). Somatotypes and angiographically determined atherosclerotic coronary artery disease in men. *American Journal of Human Biology, 12*, 128–138.
- Yarnell, J. W., Limb, E. S., Layzell, J. M., & Baker, I. A. (1992). Height: A risk marker for ischaemic heart disease: Prospective results from the Caerphilly and Speedwell heart disease studies. *European Heart Disease Journal, 13*, 1602–1605.
- Zaadstra, B. M., Seidell, J. C., Van Hoord, P. A. H., ta Velde, E. R., Habbema, J. D. F., Vrieswijk, B., & Karbaat, J. (1993). Fat and female fecundity: Prospective study of effect of body fat distribution on conception rates. *British Medical Journal, 306*, 484–487.
- Zebrowitz, L. A., Hall, J. A., Murphy, N. A., & Rhodes, G. (2002). Looking smart and looking good: Facial cues to intelligence and their origins. *Personality and Social Psychology Bulletin, 28*, 238–249.

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