An Evolutionary Theory of Female Physical Attractiveness

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Physical attractiveness, despite sustained exhortations that beauty is only skin deep and that one should not judge the book by its cover, significantly impacts practically every aspect of interpersonal relationships. Physically attractive women are admired and handsomely paid to be models, glamorized as movie actresses, and blamed for being greatly responsible for widespread body dissatisfaction and eating disorders in young women. The argument that fairy tales and the media link physical beauty to positive attributes does not explain why children as young as 14 hours old gaze at adults judged to have attractive female faces longer than those who have unattractive faces. What is the basis for such allure and power of attractiveness?

To understand the nature of physical attractiveness, the first step is to identify features that a majority of people find attractive and to search for a basis of consensus. Evolutionary psychologists use such an approach. Simply stated, evolutionary theorists argue that physical attractiveness reliably conveys biological information about a person's genetic quality, health, and reproductive potential. Being able to judge these attributes reliably would have enabled people in Stone Age environments to select healthy mates and be reproductively successful, as healthy mates would be better providers and protractors for the family unit. The problem is that the reproductive potential, capability, and genetic resistance to disease cannot be directly observed. Therefore, the selection process has shaped mental mechanisms to attend to those bodily features that are reliable indicators of health and fertility, and such features are judged to be desirable and attractive. Although people are not consciously aware of such a link, therein lies the power of physical attractiveness. Many evolution-inspired researchers have started to explore whether the facial features that are judged to be attractive, such as full lips, small chin, symmetry of bilateral facial features, and so forth, are indicators of sex hormone, reproductive potential, and healthiness (e.g., Johnston, Hagel, Franklin, Fink, & Grammer, 2001). Physical attractiveness depends on both facial and bodily features, but strangely, all the detailed analysis of what constitutes attractiveness and its link to genetic quality is restricted to faces. The attractiveness of the body, in spite of clear age-related change (e.g., prepubertal, postpubertal, and menopausal) is solely defined by body weight; skinny women are more attractive than normal weight women, who in turn are more attractive than overweight women. Fashion models are also defined by this criterion (Wow! How thin!) although most people are aware that two women of identical height and body weight do not look alike in their body shape. I believe that an attractive body defined by only body weight is due to the lack of theory about the body. The only theory that psychologists are exposed to is Sheldon's somatotype classification of endomorphs, mesomorphs, and ectomorphs. This classification gave rise to categories of fat or overweight (endomorphs), normal weight (mesomorphs), and thin (ectomorphs; cf. Jackson, 1992).

In this paper, I will present evidence that body shape is determined by the nature of body fat distribution that, in turn, is significantly correlated with women's sex hormone profile, risk for disease, and reproductive capability. First, I will describe the anatomical location of body fat deposits and its effect on health, hormone, and some psychological variables. Then I will present data showing that systematic changes in the nature of body fat distribution systematically affect the judgment of female physical attractiveness. Finally, I will argue that body dissatisfaction, which is so prevalent in young women in our society, could be due not only to body weight but also to dissatisfaction with distribution of their body fat. If so, losing body weight by dieting may not lead to positive body image as weight loss does not significantly alter the nature of fat distribution.

Body Weight and Body Shape

Fat distribution in humans depends both on age and gender: the sexes are similar in infancy, early childhood, and old age, but differences in fat distribution are greater from the early teens until late middle age (Vague, 1956). There is extensive evidence that sex hormones affect specific regional adiposity and regulate utilization and accumulation of fat (Pond, 1981). Simply stated, estrogen inhibits fat deposition in the abdominal region and stimulates fat deposition in the gluteofemoral region more than in other body regions. Testosterone, in contrast, stimulates fat deposition in the abdominal region and inhibits deposition in the gluteofemoral region (Bjorntorp, 1991). It is this sexually dimorphic body fat distribution that primarily sculpts the typical body shape of women after pubertal onset. Figure 1 shows the sex difference in body shape in men and women as a function of age but independent of body weight. It should be obvious that in spite of the lack of typical sex differences associated with the two sexes (i.e., breasts, long hair, etc.) one can readily identify the sex of the schematic body figure after puberty.

It is important to note that women have greater amounts of body fat in lower parts of the body (gynoid–aka–"pear-shaped" body fat) whereas men have greater amounts of fat in the upper body (android–aka–"apple-shaped" body fat) induced by the circulating level of sex hormones between the two sexes. To demonstrate that the female body shape is judged attractive due to its reliable link that men would have sought out in ancestral populations, it is essential to establish that this shape has a plausible linkage to physiological mechanisms regulating reproductive capability and good health. Furthermore, variation in the gynoid body shape should not only be correlated with variation in reproductive potential, but such variations should systematically affect the judged degree of female attractiveness. The nature of body fat distribution, which largely determines the gynoid body shape, meets most of the above-stated criteria.

Waist-to-Hip Ratio (WHR)–Measure of Body Shape

A widely-used anthropometric technique to ascertain the degree of gynoid and android fat distribution is to measure circumference of the waist (narrowest portion between the ribs and iliac crest) and hips (at the level of the greatest protrusion of the buttocks), and using these measurements to compute a waist-to-hip ratio (WHR). WHR is a stable and highly reliable measure and is significantly correlated with fat distribution measurement using computed tomography scanning (Despres, Prud'homme, Pouliot, Tremblay, & Bouchard, 1991). Before puberty, both sexes have similar WHRs. After puberty, females deposit more fat in the hips and buttocks; WHR therefore becomes significantly lower in females than in males. WHR has a bimodal distribution with relatively little overlap between the sexes. The typical range of WHR for healthy premenopausal women has been shown to be .67 to .80, whereas healthy men have WHRs in the range of .85 to .95. Women typically maintain a lower WHR than men throughout adulthood, although after menopause their WHR approaches the masculine range (for evidence summary, see Singh, 1993a). Thus, the size of WHR can be used as a reliable proxy of women's general reproductive status (pre or postpubertal and menopausal) and youthfulness.

WHR, Reproductive Function, and Health Status

There is strong evidence indicating that WHR is an accurate somatic indicator of reproductive endocrinological status and long-term health risk (see Table 1).

As evidenced from the findings summarized in Table 1, WHR reliably links practically all the conditions that affect women's reproductive status and fertility (for reference, see Singh, 1993a, 2002). It seems that an elevated level of circulating estrogen lowers WHR, whereas an elevated level of circulating testosterone increases WHR. Women with high WHR have more irregular menstrual cycles, fewer ovulatory cycles, and lower pregnancy rates in artificial insemination and in vitro fertilization embryo transfers than women with lower WHRs, independent of body weight. One of the significant problems affecting the reproductive success of ancestral population males would have been to assess whether a potential mate was nubile nullipara (have not given any birth), as such women have higher fecundity than those who have given birth or are lactating; multiparity (number of children given birth to) directly increases the size of WHR. More critically, WHR size can be used to roughly estimate whether a woman is in the early stages of pregnancy induced by another male; investing resources in a child fathered by another male does not enhance a male's reproductive success. The size of WHR increases even in the early stages of pregnancy.

Reproductive success of men in ancestral environments would have depended on selecting a healthy partner. Healthy females would have successful pregnancy outcomes, would provide better maternal care, and would give the genetic gift of good health to her children more so than females prone to various diseases. WHR is an independent predictor for risk for cardiovascular disorders, adult-onset diabetes, and various cancers. Admittedly, these are modern diseases and may not have existed in ancestral environments. People in ancestral environments, however, would have faced various parasites and those with genetic resistance would have survived better than those with lower or no such resistance. There are some parasites that are currently encountered by people living in nonindustrialized, non-Western societies. For example, schistosomiasis and kala-azar (leishmaniasis) are frequently observed in underdeveloped countries throughout the world. People suffering from schistosomiasis have liver dysfunction, although pathogen infestation does not cause immediate mortality (infected individuals can remain asymptomatic and survive 10-15 years), even when asymptomatic-infected individuals have decreased energy and develop larger bellies. The enlargement of belly size would affect the size of WHR. Hence, WHR can act as an indicator of low energy levels in such cases.

In summary, WHR size provides reliable information about the reproductive age, fertility, and health status of a woman at a glance. If fertility and good health are significant determinants of female attractiveness, one should be able to affect female attractiveness judgments systematically by manipulating WHR size alone.

WHR and Attractiveness Judgments

To establish that males possess perceptual mechanisms to detect and link WHR to female attractiveness, I developed 12 drawings of female figures, differing solely in body weight and WHR size (Singh, 1993a). Figure 2 shows three body weight categories (underweight, normal, and overweight); within each weight category, line drawings represent four WHR levels: two typical gynoid (0.7 and 0.8) and two android (0.9 and 1.0) WHRs.

In the initial series of research (Singh, 1993a, 1993b), judgments of attractiveness, healthiness, and youthfulness were obtained for these figures from men and women of diverse ages (18-85 years old), professions (white collar workers, lawyers, physicians), educations (undergraduates and postgraduate degree), and ethnicities (African American, Mexican-American, and Euro-American). Figure 3 illustrates the data for attractiveness.

Prior to summarizing the main findings, it is critical to justify the rationale for using both male and female judges in investigating female attractiveness. Consider the following: If attractiveness is a signal of mate quality, females (signal generators) and males (signal receivers) must share the meaning and significance of such signals to be biologically useful. If women knew what men find attractive, they could highlight such features with the help of makeup, dress, corsets, or tight belts (deception tactics). On the other hand, if a woman wishes to convey that she is not sexually available, she can hide such features by a lack of makeup or choice of dress style or clothing (a nun's habit or a business suit). If this reasoning is valid, there should not be, and indeed there isn't, any sex difference in judgment of female attractiveness (Singh & Luis, 1995).

Cross-cultural Appeal of WHR

To label a mental or perceptual mechanism as shaped by selection process, it is imperative to show that the mechanism is operative across diverse ethnic and cultural groups of humans. The effect of WHR on female attractiveness has now been reported for almost 20 ethnic and culture groups: USA (White, Black, and Latino), England, Germany, Holland, Poland, Greece, Australia, Kenya (Africa), Guinea-Bissau (Africa), Uganda (Africa), Azore Island, Shiwiar tribe of East Ecuador, Indonesia, Hong Kong (China), India (Sugali and Yanadi tribes), Chile (South America), and Jamaica. Some researchers have suggested that the reported influence of WHR on female attractiveness cross-culturally is due to exposure to Western media. In other words, people in non-Western societies copy Western ideals when defining their own ideals of feminine beauty. The speculation that people in non-Western societies imitate Western ideals of beauty does not explain why a relationship between WHR and attractiveness exists in Western societies and why Asian and African societies, which reportedly associate fatness with attractiveness, nevertheless attend to and are influenced by WHR.

One way to examine whether WHR is an adaptive trait or whether the link between attractiveness and WHR is derived from Western media would be to explore if people in various societies associate healthiness with WHR-based attractiveness. While the evolutionary explanation postulates a positive linear association between WHR and health, the media makes no such association.

Figure 4 shows ratings of attractiveness, healthiness, youthfulness, and desirability as a marriage partner made by five cultural groups for female figures differing in WHR.

As evident in Figure 4, all groups have practically identical ratings for all attributes in spite of extremely diverse cultural backgrounds; men from Guinea-Bissau (one of the poorest countries, with practically no exposure to Western media), Azore Island (which has government-controlled, commercial-free television), Indonesia, and U.S. (African-American and Caucasian) rate figures as less attractive, less healthy, older, and less desirable for marriage as WHR increases (Singh, 2004; Singh & Luis, 1995). Furthermore, attractiveness, healthiness, and youthfulness covary in identical manners as a function of WHR for all groups. Such systematic convergence of perceived attractiveness, healthiness, and youthfulness based solely on WHR cannot be attributed to media exposure.

Conclusion: Defining Beauty

The evidence summarized in this paper demolishes the myth that beauty is ever-changing, skin-deep, and superficial. The attractiveness judgment based on figures defined by WHR is a robust phenomenon evident in various cultures. I have presented data to establish that the allure of the hourglass figure is "programmed" in the human mind, because it provides important biological information about a woman's youthfulness, health status, and fertility.

It should be stressed that the notion of what constitutes female attractiveness is wired in the human mind does not imply that judgment of attractiveness is rigid and impervious to environmental conditions. There are huge differences among various human societies due to ecological conditions. Therefore, one of the variables that may shape the nature of preferences is the population-typical ranges of body weight and WHR distribution. As pointed out by Symons (1979), psychological mechanisms could instantiate a rule to prefer WHR somewhat lower than the local female average. As there are population specific variations in the size of the WHR, it could be that female attractiveness is defined on the basis of being somewhat lower than the local female average rather than some absolute size of WHR (Sugiyama, 2004). For example, in societies where the local average of WHR of female population is say 0.80, men in the society may judge women with 0.75 WHR attractive, whereas in societies with the average of 0.73, men may judge women with 0.75 as unattractive. It is also critical to remember that WHR, like any other marker of good health, such as blood pressure or heart rate, has a range within which deviation can take place. The critical variable is not 0.70 WHR, but the feminine range of WHR (0.67-0.72 in young U.S. women) and the women with WHRs lower than local male population WHR should be judged attractive.

Finally a puzzle: If beauty is instantly perceived and processed due to "genetic programming," why do people have problems describing what makes a woman beautiful? Consider the statue of Venus de Milo. Most people will agree this statue represents a beautiful woman. But when asked to describe what makes her beautiful, some people may attribute her beauty to her symmetrical round breasts, whereas others attribute it to her full and round buttocks. This is probably due to the fact that modern nomenclature provides few means for describing the gestalt of "attractive" female body shapes (the term "hourglass figure" is a notable exception). This linguistic limitation may have fostered the prevailing tendency to focus on discrete body parts when describing female beauty. This can be very clearly visualized if one changes either the size of the breasts or buttocks of Venus de Milo and discards the proportionality of these parts of her body.

Likewise, in present society, the perception that a beautiful female is necessarily thin does not convey any information about the proportionality of the woman's body parts that is essential to defining beauty. This of course does not imply that people in all societies prefer slim female bodies, or that they all prefer similar shape and sizes of body parts. There are marked differences in preferences for large full buttocks in African Americans whereas Caucasians tend to prefer less lateral fat on the thighs and smaller buttocks, and Mexican Americans tend to prefer very narrow waists (Roberts, 2005). In spite of these variations in body part preferences, people from these different ethnic groups judge a female figure with close to 0.7 WHR as maximally attractive. The evolutionary forces have designed psychological adaptations to adjust facultatively certain determinants of sexual attraction to local ecological conditions (e.g., in environments of food scarcity, men may prefer plump women with strong legs) and distinct morphological features (e.g., skin pigmentation, type of hair, shape and size of nose and lips) of certain races. What evolution would have required is that the core feature indicative of health and fertility be consistently judged as beautiful in all these conditions. Thus, cross-racial consensus exists in perceptions of female attractiveness. For example, Caucasians are likely to judge Miss Japan and Miss Nigeria as beautiful despite racial differences. For another example, after being told the bodily measurements of Miss Universe are 35-24-35, one seems likely to envision a beautiful woman but not one of any particular ethnic group. The body shape is a template of female sexual attractiveness and serves as a reference point. Various ethnic groups may consciously feel that the shape and size of a given body part are what make a woman beautiful, but the relationship among the body parts remains invariant and marked deviations from this idealized body shape diminishes sexual attractiveness.

Implication for Body Image Dissatisfaction

Body weight and body shape (as defined by WHR) are overlapping variables, but attractiveness cannot be defined on the basis of body weight or body shape alone. Given this, some young women may be dissatisfied with being overweight (although have appropriate WHR), whereas others may be of normal body weight but dissatisfied with their shape, and finally there are those who are dissatisfied with both body weight and shape (Singh, 1994). Sorting women on these parameters may be critical for developing effective intervention techniques. A recent study by Hefferman, Harper, and McWilliam (2002) showed that women remain dissatisfied with their body image after they have lost weight by dieting but have high WHR. As WHR is a proportional measure, weight loss up to 16 pounds does not change it; to obtain ideal WHR, one has to exercise. By paying attention to body shape (WHR), it may be fully possible to understand why some young women, in spite of being normal or underweight, insist on losing weight and are preoccupied with body weight reduction (see Davis & Cerullo, 1996).

Figure 1.

Schematic drawings of sexually dimorphic body shape from age 1-9 years (panel A) and from age 10-18 years (panel B). The body shape differences become strikingly different after puberty, and the sex of the figure can be accurately judged in the absence of any facial features or other secondary sex characteristics.

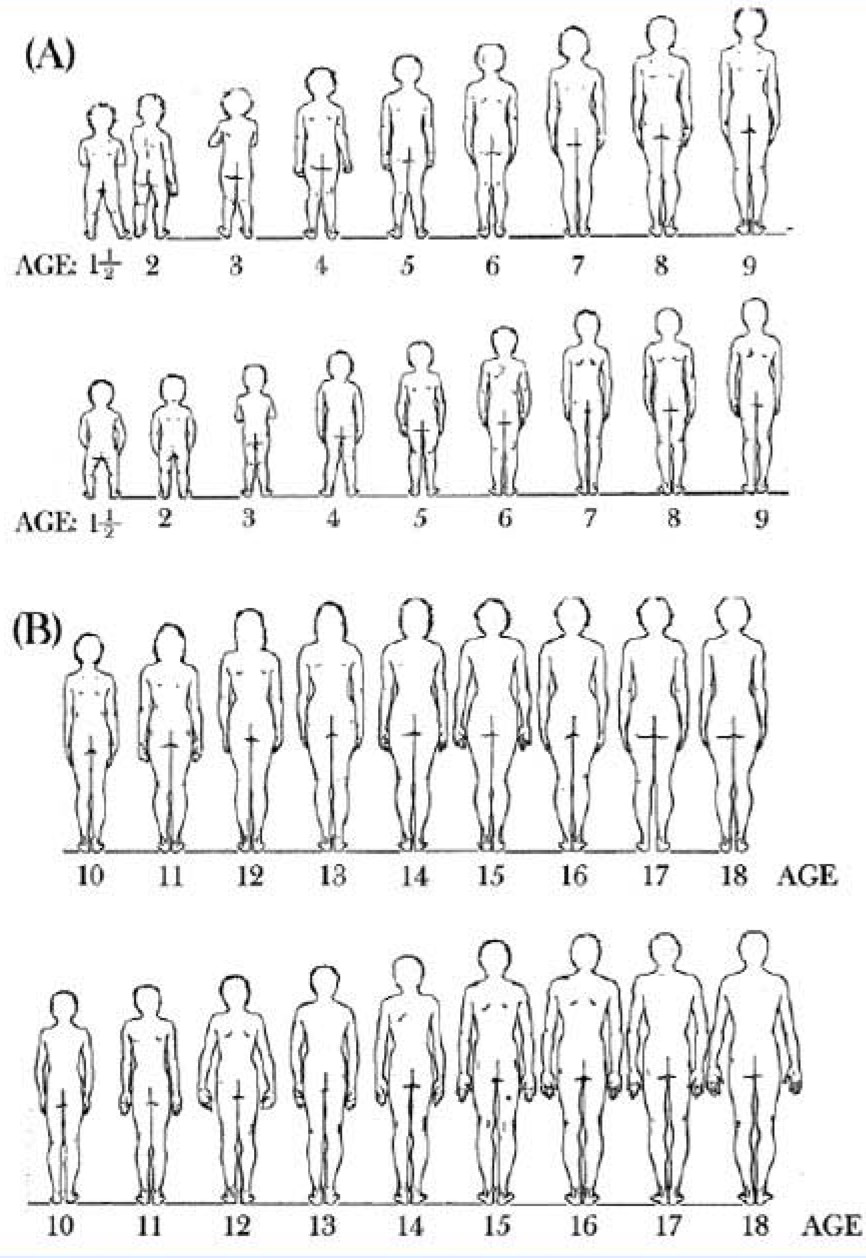


Table 1.

Risk to Various Physical and Psychological Disorders in Women with Lower WHR (<.80) than Women with Higher WHR (>.80).

I. General Physical Health

Lower risk for:

- Cardiovascular diseases
- Adult-onset (Type II) diabetes
- Gallbladder disease
- Lung functions impairment
- Carcinomas (endometrial, ovarian & breast)
- Lower all-cause mortality

II. Psychological/mental health

Lower risk for:

- Anxiety (including phobic social anxiety) disorders
- Depression
- Hyposexual desire

Efficient stress coping (based on cortisol release)

III. Reproductive potential/outcome

Lower risk for:

- Hyperandrogynism and hirsutism
- Menstrual irregularity, anovulatory cycles

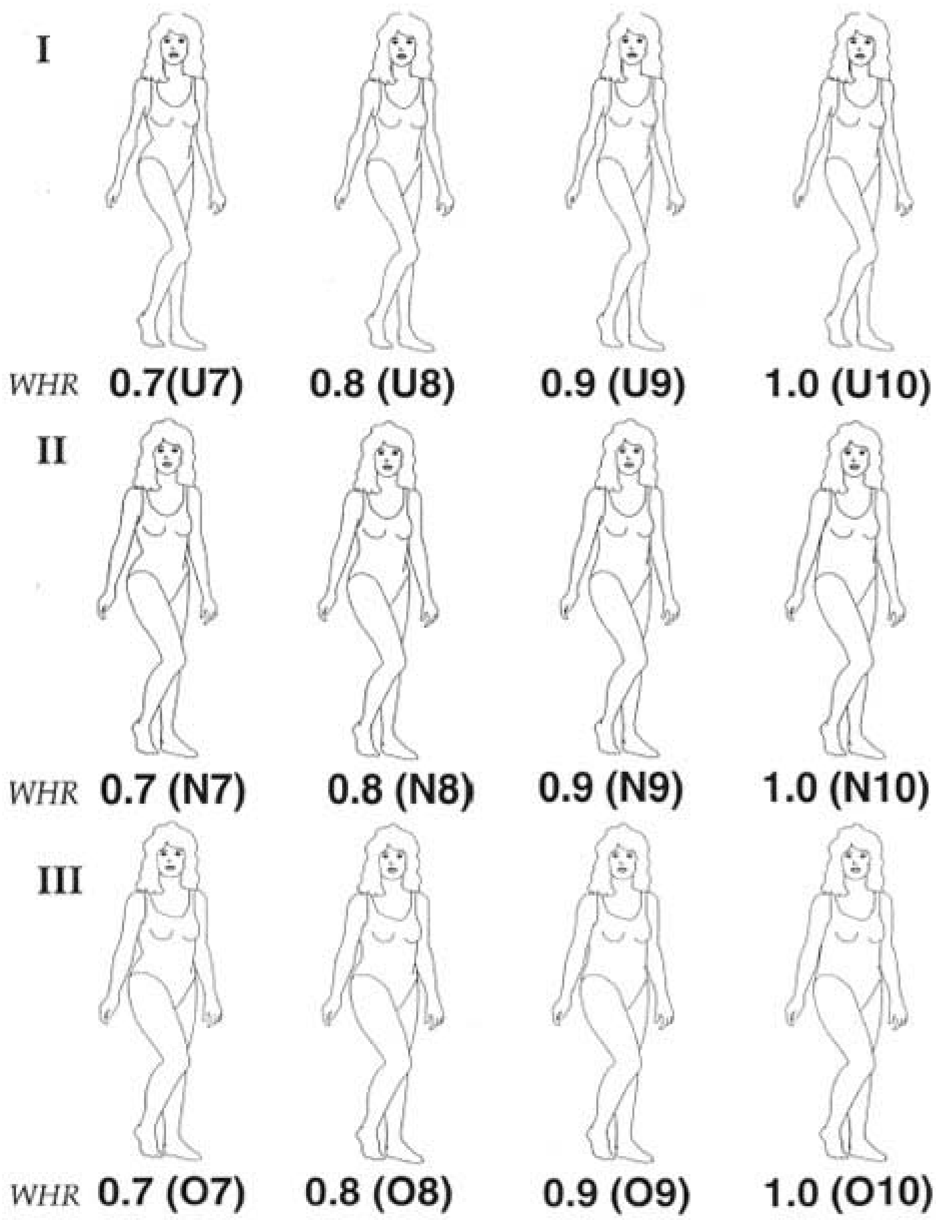
Optimal sex hormone profile (higher 17-beta-estradoil [E2] level, lower level of bioavailable testosterone)

Normal endocervical mucus pH (facilitates sperm viability)

Greater probability of successful pregnancy outcome in artificial insemination and in-vitro fertilized embryo transfer programs

Figure 2.

Female body figures differing in body weight (U=underweight, N=normal weight, 0=over-weight) and four levels of WHR (0.7, 0.8, 0.9, and 1.0).



Note. From "Adaptive Significance of Female Physical Attractiveness: Role of Waist-to-hip Ratio," by D. Singh, 1993, *Journal of Personality and Social Psychology, 65*, p. 298.

Figure 3.

Mean rating for attractiveness summed across various groups for 12 figures differing in body weight (U = underweight, N = normal weight, O = overweight) and the size of WHRs.

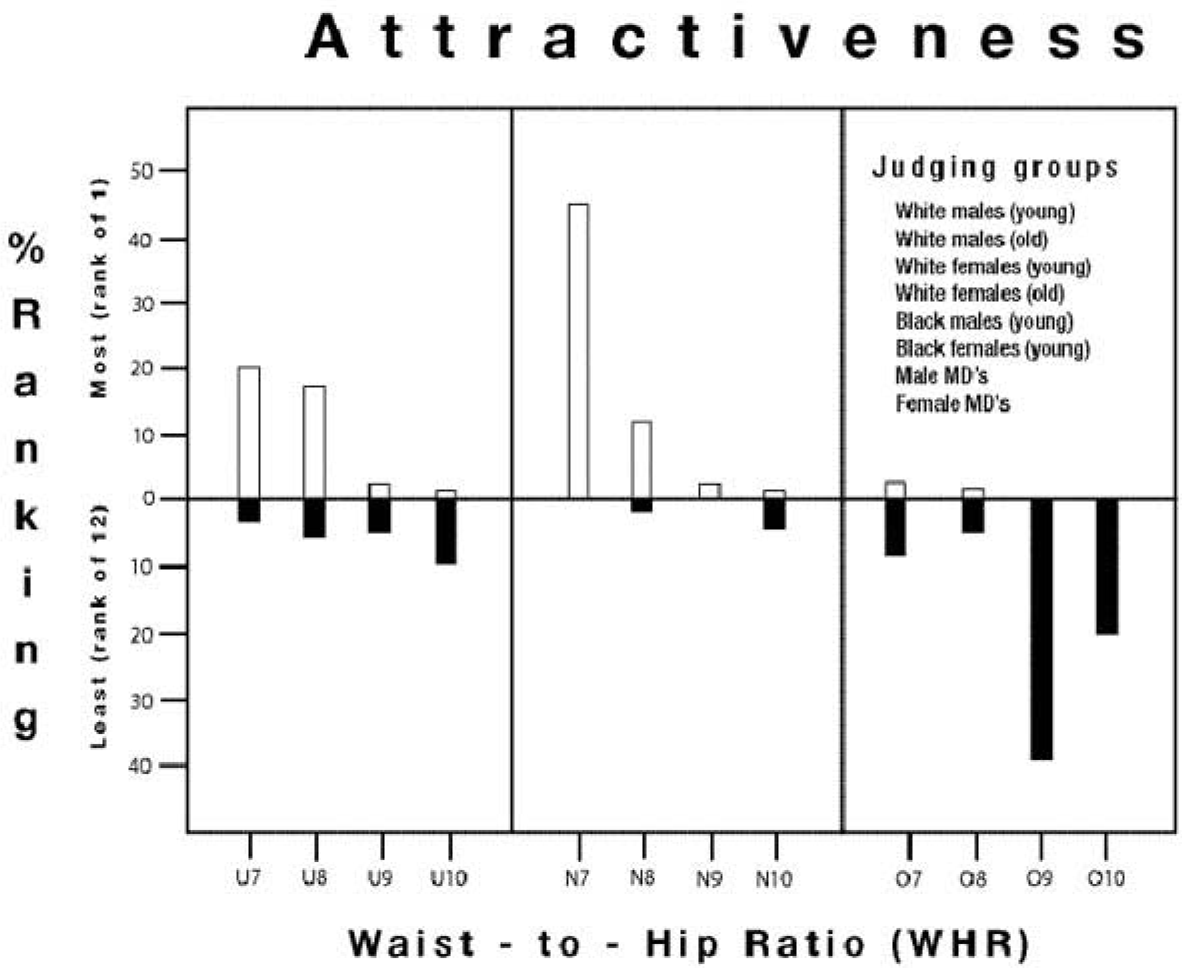
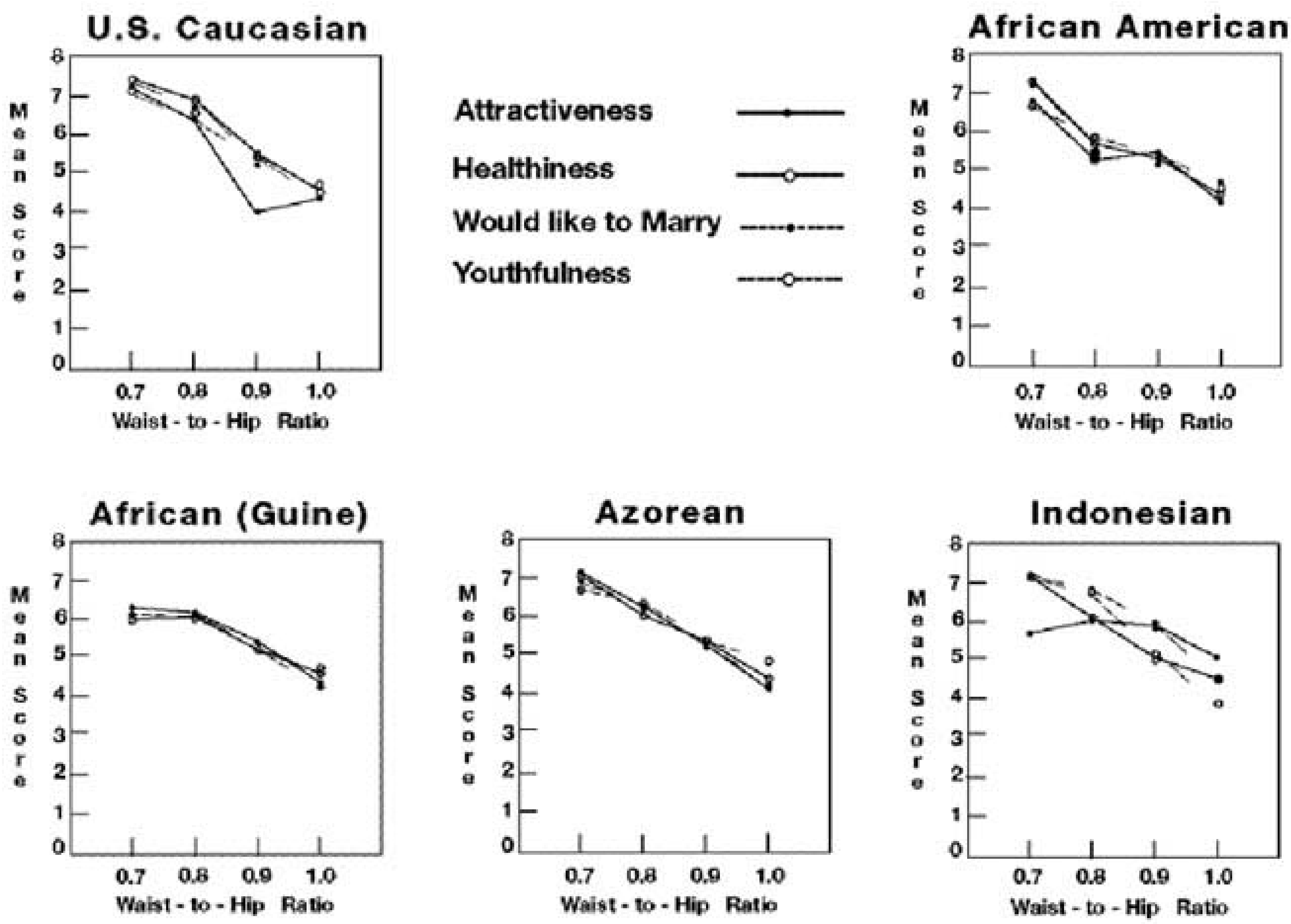


Figure 4.

Mean ratings of female figures differing in their size of WHR by U.S. Caucasian, U.S. African American, Guinea Bissau, Azore Islanders, and Indonesian for attractiveness, youthfulness, healthiness, and preference for marriage partner.



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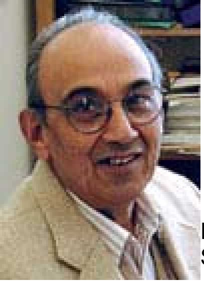

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Dr. Singh has always been interested in undergraduate teaching and research and has received two university-wide teaching awards. He was the faculty advisor to the Psi Chi chapter for six years and has published many papers with undergraduate students. He feels it is a privilege to work with bright, inquisitive undergraduates.

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