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The influence of leg-to-body ratio (LBR) on judgments of female physical attractiveness: Assessments of computer-generated images varying in LBR

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ABSTRACT

The leg-to-body ratio (LBR), which is reliably associated with developmental stability and health outcomes, is an understudied component of human physical attractiveness. Several studies examining the effects of LBR on aesthetic judgments have been limited by the reliance on stimuli composed of hand-drawn silhouettes. In the present study, we developed a new set of female computer-generated images portraying eight levels of LBR that fell within the typical range of human variation. A community sample of 207 Britons in London and students from two samples drawn from a US university (*Ns* = 940, 114) rated the physical attractiveness of the images. We found that mid-ranging female LBRs were perceived as maximally attractive. The present research overcomes some of the problems associated with past work on LBR and aesthetic preferences through use of computer-generated images rather than hand-drawn images and provides an instrument that may be useful in future investigations of LBR preferences.

Introduction

The topic of human beauty has garnered a great deal of attention within art and philosophy, and more recently, within the psychological sciences (for reviews, see Swami, 2007; Swami & Furnham, 2008). A person's physical attractiveness can have a significant impact on her or his life. One meta-analysis found that attractive individuals were more likely than unattractive individuals to be judged as competent in their professions, to experience success in their occupations, and to be treated more favorably by others (Langlois, Kalakanis, Rubenstein, Larson, Hallam, & Smoot, 2000). Appearance also matters to people when choosing a mate in many cultures: in a study of 37 countries, both men and women ranked physical attractiveness as one of the most important traits they were looking for when choosing a long-term mate (Buss, 1989). In short, looks matter; but what physical features do people attend to when judging a person's physical attractiveness?

In the psychological literature, a growing body of research has attempted to identify whether some traits are attractive because humans have evolved to attend to traits that are cues to fertility, robustness, or ability to produce robust offspring (e.g., Gangestad & Simpson, 2000). Among the bodily traits that have recently garnered attention are breast size, height, body symmetry, muscularity, hair color and length, facial dimorphism, skin tone, and waist-to-hip ratio (e.g., Frederick, Fessler, & Haselton, 2005; Frederick & Haselton, 2007; Furnham, Swami, & Shah, 2006; Salska, Frederick, Pawłowski, Reilly, Laird, & Rudd, 2008; Swami, Jones, Einon, & Furnham, 2009; Swami & Tovée, 2005). Often overlooked in this literature is the potentially important role that the leg-to-body ratio (LBR) plays in judgments of attractiveness.

Swami, Einon, and Furnham (2006) suggested that the LBR – measured as the ratio of leg length relative to the torso including the head – should play a role in judgments of attractiveness because of the possibility that the trait is a cue to health status. Specifically, the evidence suggests that longer leg length relative to the torso is associated with various life outcomes including reduced risk of coronary heart disease, diabetes resistance, low blood pressure, better cardiovascular profiles, lower adult mortality, and reduced risk of cancer. Short legs relative to the torso may also be associated with lower fertility, reduced biomechanical efficiency (e.g., poorer running ability), and interrupted childhood development (for relevant citations, see Fielding et al., 2008; Sorokowski & Pawłowski, 2008; Swami et al., 2006). For example, one study compared the height and relative leg length of over 1800 Mayan children who were raised in the US versus Guatemala

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(Bogin, Smith, Orden, Varela Silva, & Loucky, 2002). They found that children raised in the US were significantly taller (11.5 cm) than children raised in Guatemala and that this greater height was disproportionately attributable to relatively longer legs (6.8 cm), supporting the hypothesis that relative leg length is particularly sensitive to environmental factors.

After identifying this association between LBR and health status, Leitch (1951, p. 146) noted that: "High class fashion journals depict women with an extreme length of limb, and decorative art does the same for both men and women [...]. When the artist wishes to depict the lower orders, as such, or the comic, he draws people with exaggeratedly short limbs and makes them fat." Evidence for the proposition that persons with longer legs are seen as more attractive, however, has been mixed. In one study in Hong Kong, researchers presented participants with three-dimensional images of people and reported that the participants found long-legged women more attractive (Fan, Liu, Wu, & Dai, 2004). Using a similar technique, Swami et al. (2006) presented participants with five line-drawings of women varying in LBR. They found that women with relatively longer legs were judged more attractive than women with shorter legs.

To explore the factors that influence preferences for LBR, Swami, Einon, and Furnham (2007) administered these measures to villagers in rural Malaysia. In contrast to the results reported with Western participants, rural Malaysians tended to prefer women with LBRs in the middle range, although participants who reported more exposure to Western media preferred longer legs. These findings suggest that preferences for LBR are malleable in response to different ecological and sociocultural conditions. In particular, the preferences for longer legs found in Western samples may be due to the fact that long legs have been specifically eroticized in these cultures (cf. Morris, 1987).

The findings to date have supported the idea that LBR does impact judgments of physical attractiveness. However, the findings have not strongly supported the idea that it is specifically long legs that makes a person more attractive. One possibility is that the general hypothesis – that a higher LBR should be preferred – needs further refinement. A second possibility is that the stimuli being used in studies of preferences for LBR are problematic and have notable confounds that are interfering with the ability to properly test available hypotheses.

In particular, the stimuli used by Swami et al. (2006, 2007) have been criticized for having poor ecological validity and for not being based on established anthropometric data (Sorokowski & Pawłowski, 2008). After modifying the Swami et al. (2006) figures by darkening the images, Sorokowski and Pawłowski (2008) reported a preference for female LBRs in the mid to upper-middle ranges of their stimuli in an Eastern European sample. Unfortunately, the stimuli used by Sorokowski and Pawłowski (2008) also suffered from poor ecological validity. As a result, none of these studies can claim to be presenting an accurate account of LBR preferences, although they have made an important start in this area of research.

The work of Riling, Kaufman, Smith, Patel, and Worthman (2009) represents a significant advance over the previous research, as they presented standardized videos of 43 women varying in on a wide variety of physical dimensions (e.g., LBR, abdominal depth, hip circumference, etc.). The authors found that women with relatively long legs were rated more attractive. This study represents an advance in the literature through its reliance on images of real women, although possible curvilinear associations between LBR and attractiveness were not explored. To improve on and extend the existing research, the present study examined LBR preferences using carefully controlled computer-generated stimuli that more realistically depict the female form compared to the earlier silhouette-based studies.

The primary goal of our study was to examine men's and women's perceptions of individuals varying in LBR. Given that relatively short legs have been associated with lower SES and poorer health outcomes, our first prediction was that individuals with the shortest legs in our stimuli set would be perceived as less attractive than individuals with relatively longer legs. Predictions regarding preferences for individuals with the longest legs were less clear a priori. On the one hand, eroticization of long legs and the general association of longer legs with greater health leads to the prediction that the longest legs would be rated most attractive. Conversely, if participants perceived that the longest legs were abnormally long, this might lead to lower ratings of attractiveness for these images.

Method

Participants

We recruited three samples. The first sample was recruited from four psychology classes at UCLA and included 705 women and 235 men (age $M = 18.93$, $SD = 1.45$). The participants identified as being of Asian background (39%), White (29%), Latino/Hispanic (13%), or of biracial or other backgrounds (19%). The second sample was recruited by research assistants who approached individuals in coffee shops at UCLA and included 50 men and 64 women (age $M = 22.70$, $SD = 5.96$). Information about ethnicity was not gathered for this second sample. The third sample consisted of 101 women and 106 men (age $M = 27.10$, $SD = 12.40$) recruited from the community in Greater London. Participants were classified as White (46%), Asian (31%), African Caribbean (19%), or other (4%). Permission to conduct the study was obtained from the local institutional review boards or university ethics committee for each study site.

Measures

The stimuli used in the present study were created using Poser 7.0 (e frontier America Inc., 2006). This rendering and animation software program provides alterable models that depict the human figure in three-dimensions. A professional graphics artist was instructed to design baseline female figures using anthropometric norms for LBR available in Poser 7.0. One way to determine LBR is the distance from the bottom of the feet to the perineum divided by total height. The LBR of our baseline image by this measure was 0.495, which closely approximates the same measure reported by Sorokowski and Pawłowski (2008) as the norm for Polish adult females (0.51) and for the sample they collected (0.49). We then lengthened or shortened the legs while simultaneously shortening or lengthening the torso to generate a series of images with the same height ranging in LBR. For this study, we chose eight images, starting with an LBR of 0.46 and increasing at equal intervals up to 0.53 (see Appendix A). The images fell within the range of actual LBRs of participants measured by Sorokowski and Pawłowski in their study (0.41–0.54), suggesting that the figures in our study fall within the typical range of human variation. The images were printed in black and white using a high quality laser printer so that the ethnic category of the images was somewhat ambiguous.

Procedure

In the first sample, consistent with past research using other stimuli varying systematically in body type (e.g., Fallon & Rozin, 1985; Frederick et al., 2007), the images were presented simultaneously in order from smallest LBR to highest LBR. Men were asked to "rate how attractive you find each body" and women were asked to "rate how attractive you think each body is to men"