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Original Article

IDENTIFYING FEMININE AND MASCULINE RANGES FOR WAIST-TO-HIP RATIO

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Abstract
Waist-to-hip ratio (WHR) has been shown to negatively correlate with attractiveness, health, youthfulness, and the reproductive potential of females, which arguably explains why men tend to perceive women with lower WHRs as more attractive. Additionally, it has recently been hypothesized that men are attracted to feminine ranges of WHR even when the actual sex of the target is ambiguous. The current study tests the hypothesis that lower WHRs are reliably associated with women and higher WHRs with men, thus serving as a proximate mechanism by which men find lower WHRs more attractive. An online survey was developed in which line drawings of human waists and hips, with WHRs ranging from 0.65 to 0.95 and no cues for sex identification, were presented to participants who were then asked to infer the sex of the drawings. Results from 72 men and 49 women indicate an increasing frequency of "female" identifications as WHR decreases. Both men and women exhibit high inter-rater reliability in associating low WHRs with women and high WHRs with men. The implications of these findings are discussed, and directions for future research are highlighted.

Keywords: Waist-to-hip ratio, WHR, gender identification.

Introduction

Researchers have demonstrated that men tend to prefer women with a low waist-to-hip ratio (WHR) of roughly 0.6-0.7 (Singh, 1993), and that this preference extends across cultures with few exceptions (Brown & Konner, 1987; Dixson, Dixson, Li, & Anderson, 2007; Furnham, McClelland, & Omer, 2003; Singh, Dixson, Jessop, Morgan, & Dixson, 2010; Sugiyama, 2004; Swami, Caprario, Tovee, & Furnham, 2006). This preference does not appear to be arbitrary, as WHR has been shown to be negatively correlated with health, youthfulness, and reproductive potential (Singh, 1993). These findings suggest an ultimate explanation for the low WHR preference, as throughout

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human evolutionary history, men who were more attracted to (and mated with) women with a low WHR would have, on average, realized greater fitness benefits relative to those who were less attracted to low WHRs. Additional supportive evidence for the adaptive function of preferring low WHR is that the higher concentrations of gluteofemoral fat and lower concentrations of abdominal fat associated with a low WHR result in a greater availability of long-chain polyunsaturated fatty acids, which are vital for the cognitive development of fetuses and infants (Lassek & Gaulin, 2008). Indeed, Lassek and Gaulin (2008) have found that women with low WHRs have higher cognitive ability, and that their offspring have higher cognitive ability as well.

In addition to the behavioral evidence of a male preference for lower WHRs (e.g., Singh, 1993; Singh et al., 2010) Platek and Singh (2010) have provided evidence at the neural level by demonstrating with fMRI that optimal female body configurations (e.g., low WHR) activate areas of men's brains that are associated with reward processing and appetitive behaviors. These findings point towards the proximate mechanisms responsible for the low WHR preference, but additional research is needed to better understand the cognitive processes by which men find lower WHRs more attractive.

Johnson and Tassinary (2005), using animated human walking stimuli, demonstrated that the determination of figures as being male or female is based, at least in part, on their physical morphology (e.g., WHR). On this basis, it has recently been proposed that, at the proximate level, perceptions of attractiveness stemming from WHR are a matter of sex-differentiation, with men perceiving particular ranges of WHR as feminine or masculine, regardless of the actual gender (Pazhoohi, 2011). In other words, men may perceive high WHRs as masculine, and subsequently may view women with WHRs as masculine and, therefore, as less attractive than women with low WHRs. Additionally, men may view other men with low WHRs as attractive in situations where the sex of the target is ambiguous.

The current study is designed to replicate the findings of Johnson and Tassinary (2005) with simple line drawings of just the waist and hip region, with no other discernible cues to sex (see Figure 1), in order to determine which WHR ratios are considered masculine or feminine and thereby clarify the strength of WHR as a cue for sex identification. More specifically, the current study tests the hypothesis that participants will reliably infer the sex of ambiguous target drawings solely on the basis of WHR.

Method

Participants

An online survey was developed and participants were recruited via advertisements posted on the classifieds website Craigslist and other social networks. Overall, 126 participants completed the survey. Five participants were dropped from all analyses because they took the survey more than once. Our analyses consisted of data from 72 Caucasian men (mean age = 28.4 years, *SD* = 8.3) and 49 Caucasian women (mean age = 25.4, *SD* = 3.7).

Materials

Eleven black line drawings of the waist and hip region of the human body were depicted on a gray background (RGB 127). The drawings differed only in WHR, and

there were no other cues that could be used for sex identification. The WHRs of the stimuli were 0.65, 0.68, 0.71, 0.74, 0.77, 0.80, 0.83, 0.86, 0.89, 0.92, and 0.95. Each WHR was created by adjusting waist size while keeping hip size constant (see Figure 1).

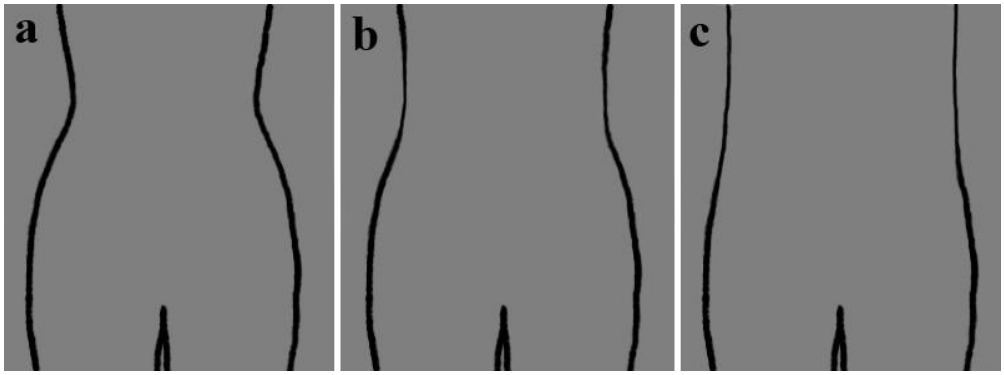

Figure 1. Examples of line drawings used in the current study, with WHRs of a) 0.68, b) 0.74, and c) 0.86.

Procedure

Participants were asked to provide their sex, age, and ethnicity at the beginning of the survey. The stimuli were then displayed one at a time and were randomized for each participant. Upon viewing each line drawing, the participant was instructed to determine whether the drawing depicted a male or a female. After choosing a sex, the next line drawing was displayed, and this process continued until the participant had chosen a sex for each of the 11 drawings.

Results

The participants provided a total of 1,331 categorizations of "male" or "female" (121 responses for each of the 11 line drawings). Of these 1,331 responses, there were 667 "female" categorizations and 664 "male" categorizations. The mean WHR of the "female" categorizations was .73 (SD = .07), which was significantly lower than the mean WHR of the "male" categorizations (M = .87, SD = .07), $t(1329) = 34.702$, $p < .001$, Cohen's $d = 1.904$. The WHR most frequently categorized as female was .65, with 99% of participants categorizing it as such, whereas 100% of participants categorized the WHR of .95 as male (see Figure 2). Additionally, after coding male categorizations as "1" and female categorizations as "2," we found a significant negative point-biserial correlation between WHR and categorization, $r_{pb} = -.689$, $p < .001$. That is, as WHR increased, participants were less likely to categorize the line drawing as female. The correlations for female participants ($r_{pb} = -.7$, $p < .001$) and male participants ($r_{pb} = -.684$, $p < .001$) did not significantly differ ($z = 0.55$, $p = 0.58$), indicating no sex difference in categorizations.

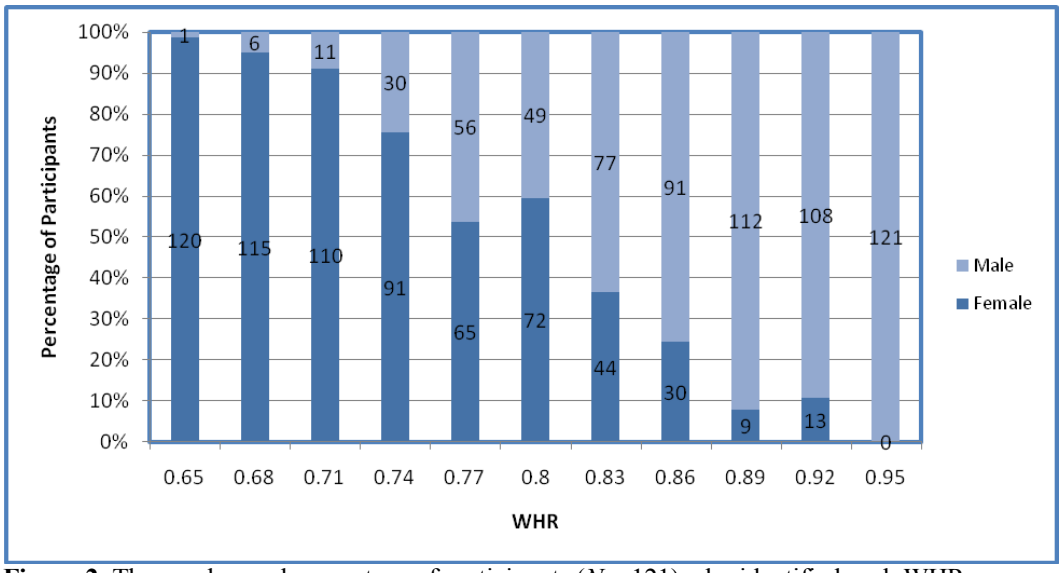

Figure 2. The number and percentage of participants ($N = 121$) who identified each WHR as indicating a male or female.

Discussion

The results of the current study are consistent with the hypothesis that WHR can be used to infer the sex of ambiguous figures when other cues to sex are unavailable (Furnham, Lavancy, & McClelland, 2001; Johnson & Tassinary, 2005), regardless of their actual sex (Pazhoohi, 2011). These results do not speak to whether such inferences are *accurate*, but nevertheless there appears to be a strong consensus among both men and women when inferring sex related to particular WHRs. More specifically, WHRs under 0.74 were predominantly perceived as female and WHRs above 0.86 were predominantly perceived as male. However, when WHR ranged from 0.77 to 0.86, the possible sex of the target appears to have been less easily inferred, as the inter-rater reliability in choosing "male" or "female" noticeably decreased within this range.

It may be the case that when WHR falls roughly within this mid-range, additional information based on other physical cues (e.g., breasts, facial cues) is required to infer whether the target is male or female (Pazhoohi, 2011). However, it is unclear from the results of the present study whether the lack of inter-rater reliability within this range stemmed from decreased confidence and a greater degree of "guessing" or simply greater idiosyncrasy in judging what constitutes a male or female form. A future study asking participants to also provide a "confidence rating" along with each categorization would clarify what is driving the lack of inter-rater reliability for particular WHRs.

The findings of the present study suggest a possible proximate mechanism by which WHR influences perceptions of attractiveness. If particular WHRs are perceived as reliable cues to one's sex, then individuals who represent a mismatch based on the cue provided by WHR (e.g., women with high WHRs or men with low WHRs) would likely be viewed as unattractive by the opposite sex. Additionally, if one's WHR is perceivable while other cues to one's sex are unavailable or ambiguous, this may result in inaccurate ratings of attractiveness due to the strength of WHR as a cue to sex identification (e.g., men rating other men with low WHRs as attractive).

It is possible that the hypothesized causal relationship between sex identification and attractiveness is actually reversed; that is, since men find lower WHRs attractive, this may lead to the inference that low WHR figures are female. However, the fact that women also interpreted low and high WHRs as being indicative of women and men, respectively, suggests that this is not the case. Since WHR is a weaker predictor of female perceptions of male attractiveness (Maisey, Vale, Cornelissen, & Tovée, 1999) than of male perceptions of female attractiveness, the lack of any observable sex difference in the current study suggests that the inference of sex via WHR is not driven by perceptions of attractiveness.

There are several avenues for future research based on the results of this study. One important addition to this study would be to gather data on the attractiveness ratings for stimuli that are similarly ambiguous to those used here. More specifically, future studies may attempt to replicate and extend the current findings with similarly ambiguous three-dimensional figures of the waist and hip region, in order to manipulate body mass index (BMI), which has been shown to have an effect on the strength of WHR as a determinant of attractiveness (Lassek & Gaulin, 2010), possibly by affecting one's ability to discriminate sex via WHR. Such figures would also allow researchers to examine potential differences in perception based on whether the image provides a frontal or profile WHR (see Marlowe et al., 2005).

Finally, although cross-cultural evidence regarding perceptions of attractiveness and WHR is fairly consistent (Singh, 2010), notable exceptions do exist (Furnham, Moutafi, & Baguma, 2002; Marlowe, Apicella, & Reed, 2005; Marlowe & Wetsman, 2001). For example, in a cross-cultural study, British and Greek subjects rated the WHR of 0.7 as the most attractive ratio, while the optimal ratio among Ugandan subjects was 0.5 (Furnham et al., 2002). This ratio was 0.6 for Chinese subjects and 0.8 for Cameroonian subjects (Dixson, Dixson, Morgan, & Anderson, 2007; Dixson et al., 2007; Marlowe & Wetsman, 2001). Therefore, since the results of the current study rely exclusively on the participation of Caucasians, we cannot assume that the results found here extend to other ethnicities until the necessary data have been collected.

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