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Sex difference in attractiveness perceptions of strong and weak male walkers

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Abstract

Objectives: Men and women accurately assess male physical strength from facial and body morphology cues. Women's assessments of male facial attractiveness, masculinity, and dominance correlate positively with male physical strength. A positive relationship also has been reported between physical strength and attractiveness of men's dance movements. Here, we investigate men's and women's attractiveness, dominance, and strength assessments from brief samples of male gait. Methods: Handgrip strength (HGS) was measured in 70 heterosexual men and their gait was motion-captured. Men and women judged 20 pre-categorized strong (high HGS) and weak (low HGS) walkers on attractiveness, dominance, and strength, and provided a measure of their own HGS. Results: Both men and women judged strong walkers higher on dominance and strength than weak walkers. Women but not men judged strong walkers more attractive than weak walkers. These effects were independent of observers' physical strength. Conclusions: Male physical strength is conveyed not only through facial and body morphology, but also through body movements. We discuss our findings with reference to studies suggesting that physical strength provides information about male quality in contexts of inter- and intrasexual selection.

Keywords: physical strength; handgrip; gait; attractiveness; men

Introduction

Investigations of male facial and body characteristics indicate that certain configurations correlate with qualities relevant to inter- and intrasexual selection, such as attractiveness and dominance (Puts, 2010). Male physical strength correlates positively with women's attractiveness and dominance perceptions of facial morphology (Fink et al., 2007). Faces of physically strong (relative to weak) men appear robust, with wide eyebrows and prominent jaw (Windhager et al., 2011). Bodies of physically strong men are characterized by broader shoulders and a higher shoulder-to-hip circumference ratio (Gallup et al., 2007).

Physical strength and corresponding facial morphology are testosterone-linked phenotypic traits (Fink et al., 2006; Page et al., 2005; Penton-Voak and Chen, 2004) and this may account for observed positive relationships between women's attractiveness assessments of male facial and body characteristics. Fink et al. (2010) reported that women's judgments of male facial attractiveness, dominance, and masculinity correlate positively with parallel assessments of men's bodies, suggesting that similar developmental mechanisms build traits that serve as condition-dependent ornaments of quality. Women's attractiveness (and masculinity) perceptions of men's bodies correlate positively with male physical fitness, and physically fit men report greater mating success (Hönekopp et al., 2007). In fact, Gallup et al. (2007) documented a positive correlation of male handgrip strength (HGS) with the number of sexual partners, and a negative correlation of HGS with age at first sex.

Male physical strength is accurately assessed from men's faces, bodies, and voices (Sell et al., 2009, 2010), and men's visual assessments of other men's physical strength are more accurate than those of women, which may reflect male adaptations for strength assessments in intrasexual selection (Sell et al., 2012). Male physical

strength is also conveyed through body movement. Hugill et al. (2009) reported positive correlations between women's attractiveness and assertiveness judgments of men's dance movements with men's HGS. More recently, the relationship of dance attractiveness and HGS was replicated for men's dances, but not for women's dances (Weege et al., 2015a), which is sensible given the perspective that signaling physical strength is relevant for men more than for women.

Here, we expand on these findings by investigating men's and women's assessments of male gait in relation to physical strength. We hypothesize that the gait of strong men would be judged higher on all three attributes by both sexes than the gait of weak men. Given ancestral women's interest in identifying high-quality men and men's strategies to outcompete rivals, we expect to observe a sex difference for perceptions of attractiveness of strong walkers (with women judging these walkers more positively than men), but not for dominance and strength assessments.

Materials and Methods

Strength and gait recordings

Participants were 80 men, aged 18 to 42 years, recruited at Northumbria University (U.K.) as part of a large-scale study on body movement in relation to anthropometry and personality (see for related reports Fink et al., 2012, 2014; Hufschmidt et al., 2015; Weege et al., 2012, 2015a,b). Participants reported that they did not have injuries that might influence their natural movements.

Handgrip strength (HGS; kgf) was measured with a hand dynamometer (Takei Kiki Kogyo K.K., Japan), twice for each hand, and the grand mean of the two left and two right HGS measurements was used for analysis. Walk movements were recorded with an optical motion-capture system (Vicon, Oxford, UK) running Vicon Nexus

software. Thirty-nine reflective markers were attached to each participant's major joints and body parts (Plug-in-gait marker set, Vicon). Participants did not receive specific instruction on how to walk, but were told to remain within a certain area of approximately 7 x 2.5 m (marked with adhesive tape on the floor) in a room dedicated to motion-capturing. A male and a female investigator was present during recordings. Gait recordings were then applied onto size- and shape-standardized, gender-neutral humanoid characters using Motionbuilder software (Autodesk Inc., San Rafael, CA, USA) and rendered as 773 x 632 pixel video clips (Figure 1). A sequence of 3 sec (approximately 4-5 strides) was digitally isolated from the middle of each walk sequence to depict men's movements, excluding the beginning and ending of the walk. Three repetitions of this sequence were used to construct a new video showing walk movements in a loop.

--- Insert Figure 1 about here ---

For the selection of strong and weak walkers, we considered only those participants for which no issues in post-processing of walk movements were noted (e.g., longer periods of occluded markers that may have resulted in inaccurate interpolation and thus unnatural movements). Of the remaining 70 men (aged 18 to 42 years, M = 21.6, SD = 4.1), the videos of the 10 strongest and the 10 weakest participants (heterosexual by self-report) were selected for the rating study. Strong and weak walkers differed in HGS (strong: M = 48.64, SD = 3.24; weak: M = 23.76, SD = 4.03; $t(18) = 15.20$, $p < .001$), but not in the number of strides displayed in the videos ($z = -.89$, $p = .37$).

Gait ratings

The gait videos were shown to 51 men and 50 women (aged 18 to 54 years, *M* = 24.0, *SD* = 5.8), recruited at the University of Göttingen (Germany). Participants judged the walk movements for attractiveness, dominance, and strength, using a 7-point scale (1 = low, 7 = high on attribute). Videos were presented on 15.6'' laptop computers, with attributes in blocks, and the order of clips randomized within each block. After completion of the rating task, each participant's HGS was measured, following the protocol reported for male walkers.

Results

Table 1 reports descriptive statistics of men's and women's attractiveness, dominance, and strength perceptions of strong and weak male walkers. A mixed-design ANOVA was performed on perception measures with walker strength as within-subjects factor and observer's sex as between-subjects factor. There was a main effect of walker strength on perceptions of attractiveness ($F(1,99) = 9.02$, $p < .01$, partial $\eta 2 = .08$), dominance ($F(1,99) = 29.99$, $p < .001$, partial $\eta 2 = .23$), and strength ($F(1,99) = 106.61$, $p < .001$, partial $\eta 2 = .52$), with strong walkers scoring higher on all three attributes. Observer's sex had a main effect on dominance ($F(1,99) = 3.96$, $p < .05$, partial $\eta 2 = .04$), with women giving higher judgments than men, but no such effect was found for perceptions of attractiveness ($F(1,99) = 0.11$, $p = .74$, partial $\eta 2 = .001$) or strength ($F(1,99) = 1.53$, $p = .22$, partial $\eta 2 = .02$).

An interaction effect of walker strength x observer's sex was detected for attractiveness ($F(1,99) = 14.16$, $p < .001$, partial $\eta 2 = .13$), with women (but not men) judging strong male walkers as more attractive than weak walkers (Figure 2). This

interaction effect was not significant for perceptions of dominance ($F(1,99) = 2.39$, $p = .13$, partial $\eta 2 = .02$) or strength ($F(1,99) = 0.91$, $p = .34$, partial $\eta 2 = .009$).

--- Insert Figure 2 about here ---

Male raters were stronger than female raters (HGS; men: $M = 49.82$, $SD = 9.06$; women: $M = 31.06$, $SD = 5.27$, $t(99) = 12.75$, $p < .001$). However, including observer's HGS as a covariate in the ANOVA model produced the same results, with an interaction effect of walker strength x sex on perception of attractiveness ($F(1,99) = 4.98$, $p < .05$, partial $\eta 2 = .05$), but not dominance ($F(1,99) = 1.39$, $p = .24$, partial $\eta 2 = .01$) or strength ($F(1,99) = 0.66$, $p = .42$, partial $\eta 2 = .007$).

Discussion

Muscular strength is sexually dimorphic (Lassek and Gaulin, 2009) and correlates positively with measures of male health, including physical functioning (Fredericksen et al., 2002), cardiorespiratory fitness (Vaara et al., 2012) and sexual behavior (Gallup et al., 2007), and negatively with male mortality (Rantanen et al., 2000). Physical strength therefore may provide a cue to male quality, and may be used by men and women in assessing the fighting ability of rivals and the quality of potential mating partners, respectively (Frederick and Haselton, 2007; Sell et al., 2009, 2010, 2012).

Our findings corroborate the assumption that, in addition to morphological and vocal cues, body movement provides information about male physical strength. Both men and women judged strong walkers higher on dominance and strength than weak walkers. However, women judged strong walkers more attractive than weak walkers,

whereas no such difference was detected in men. This suggests that i) gait cues provide information about male physical strength, and ii) physically strong men are perceived as more dominant than weak men. Women appear to use this information in their assessment of male quality (in terms of health and fitness, and in their assessments of men's competitiveness), as they provide higher attractiveness judgments to strong walkers. Similar findings have been reported for women's attractiveness perceptions of men's dance movements, with dances of physically strong men judged more positively than those of weak men (Hugill et al., 2009; Weege et al., 2015a). Men may use physical strength cues derived from other men's gait in evaluating fighting ability and, thus, his attractiveness to women as mating partner. Because strong men can inflict heavier costs in male-male competition, we expect that men do not exhibit a preference for such opponents; indeed, we did not detect a difference in men's attractiveness perceptions of strong and weak male walkers.

It may be premature to conclude that the finding of no difference in men's attractiveness assessments of strong and weak walkers is influenced by competitor derogation, as has been reported for women (Fisher et al., 2004) and although we consider this plausible, such a mechanism needs to be investigated in future research. This could include an experimental design requesting direct comparison of men's evaluations of their own physical strength with that of a potential rival. We did not detect an influence of observer's strength on gait perceptions. However, this does not preclude the possibility that men's self-perceived strength plays a role in the assessment of an opponents' strength, leading to specialized cognitive mechanisms in evaluating rivals, which may find expression not only in competitor derogation but also in anger recalibration (Sell et al., 2012).

It remains to be demonstrated which biomechanical characteristics differ in strong and weak male walkers. The present study kept information on male facial and body morphology constant; thus presenting only variation in gait quality. This limited information seems to be sufficient for men's and women's assessment of key attributes of mate quality. Having established a link between male gait and physical strength information, research could expand on these findings by considering possible moderators of this relationship. This includes asking men and women directly to assess fighting ability, for example, which together with preference data may help disentangle inter- and intrasexually selected adaptations in perceptions of male gait. In addition to biomechanics, it may be worthwhile to investigate possible effects of walking speed on perception of attractiveness and social status. Schmidt and Atzwanger (1995) reported a positive correlation of walking speed and socioeconomic status in men (but not in women). Our sample of male walkers did not show considerable variation in status, given their recruitment from the population of graduate and undergraduate college students. Thus, future research should extend the collection of motion information to a larger age range, especially when investigating gait.

In conclusion, our findings suggest that gait, independent of face and body morphology, provides information about male physical strength. While this information is perceived by same- and opposite-sex observers, men and women differ in their attractiveness assessments of strong and weak walkers. This sex difference may reflect sex-specific interests in evaluating male physical strength, influenced by inter- and intrasexual selection, leading to a focus on the assessment of mate quality vs. competitive abilities.

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