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Short-term mating strategies and attraction to masculinity in point-light walkers

Meghan P. Provost*, Nikolaus F. Troje, Vernon L. Quinsey

Department of Psychology, Queen's University, Kingston, ON, Canada K7L 3N6

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Abstract

Strategic pluralism suggests that women engage in short-term sexual relationships when the benefits to doing so outweigh the costs. We investigated attraction to indicators of good genes (namely, masculinity as demonstrated by point-light walkers) in women varying in menstrual cycle status and sociosexual orientation. When women are fertile, they have the ability to gain genetic benefits from a male partner and should also be attracted to high levels of masculinity in men as a signal of genetic benefits. Sociosexual orientation is an individual difference that indicates openness to short-term mating and, thus, should influence aspects of mating strategy. Women with an unrestricted sociosexual orientation, as compared to women with a restricted sociosexual orientation, are more likely to engage in short-term relationships and obtain fewer nongenetic resources from their mates. Thus, they should place heavy emphasis on male masculinity as a sign of genetic benefits available from their mates. In this study, women indicated the walker most attractive to them on a constructed continuum of male and female point-light walkers. In Study 1, fertile women, as compared to nonfertile women, showed a greater attraction to masculinity. In Study 2, women demonstrated a strong positive relationship between sociosexuality and attraction to masculinity.
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1. Introduction

Strategic pluralism suggests that women should generally engage in long-term mating strategies. However, if the benefits (e.g., genetic benefits for offspring) outweigh the costs of short-term mating (e.g., less parental investment, partner loss, unwanted pregnancy, etc.), then women should take advantage of short-term mating opportunities (Gangestad & Simpson, 2000). Evidence for strategic pluralism comes from women's preferences across the menstrual cycle. Because masculinity in faces (Penton-Voak & Chen, 2004), voices, body shape, and social displays (see Zitzmann & Nieschlag, 2001, for a review of the previous three factors) is associated with high testosterone levels and testosterone is an immunosuppressant, highly masculine healthy males are likely to be particularly immunocompetent (Folstad & Karter, 1992). Immunocompetency is a heritable genetic benefit available to a woman's offspring; thus, women engaging in short-term relationships should prefer highly masculine mates. Research has demonstrated that fertile women, as compared to nonfertile women, prefer higher levels of masculinity in faces (Johnston, Hagel, Franklin, Fink, & Grammer, 2001; Penton-Voak & Perrett, 2000; Penton-Voak et al., 1999) and voices (Feinberg et al., 2006), as well as dominant male social displays (Gangestad, Simpson, Cousins, Garver-Apgar, & Niels Christensen, 2004).

Further evidence of strategic pluralism in human mating is demonstrated through research investigating the inter-individual difference of sociosexual orientation. Sociosexual orientation represents a person's openness to short-term mating. People with relatively unrestricted sociosexual orientation, indicated by high scores on the Sociosexual Orientation Inventory (SOI; Simpson & Gangestad, 1991), are more likely to engage in short-term relationships than people with a restricted sociosexual orientation. Generally

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* Corresponding author. Department of Psychology, Mount Saint Vincent University, 166 Bedford Highway, Halifax, NS, Canada B3M 2J6. Fax: +1 902 457 6134.

E-mail addresses: meghan.provost@msvu.ca, 1mpb@qlink.queensu.ca (M.P. Provost).

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employing a short-term mating strategy, as compared to a long-term mating strategy, yields fewer nongenetic resources (i.e., parental effort) and increases the importance of receiving genetic benefits from sexual partners (Gangestad & Simpson, 2000). Thus, similar to women at times of peak fertility, women with unrestricted sociosexuality should prefer high levels of masculinity. Work by Provost, Kormos, Kosokowski, and Quinsey (2006) has demonstrated that unrestricted sociosexuality is related to greater attraction to the masculine mesomorph body type, as compared to average, endomorph, or ectomorph body types, and attraction to a male confederate for short-term relationships in a mock speed dating paradigm. Similarly, Waynforth, Delwadia, and Camm (2005) demonstrated that unrestricted sociosexuality in women was associated with attraction to male and female faces with masculine features.

Although there is evidence that both menstrual cycle status and sociosexuality are related to preference for masculinity, this research has only used static images and comparative judgments among stimuli that may have been confounded by variations in such characteristics as age, skin color, and health. These variables themselves influence interpersonal attraction (see, e.g.,Kenrick & Keefe, 1992, for age; Fink, Grammer, & Thornhill, 2001, for skin color; Buss et al., 1990, for health; and Jones, Little, Burt, & Perrett, 2004, for healthy skin in particular). In this study, we investigated the effect of menstrual cycle stage and sociosexuality on female attraction to masculinity using point-light displays of human walkers. Point-light displays limit the influence of confounding variables and, thus, are beneficial in testing specifically for a preference for masculinity. These stimuli contain information on walker structure and walking dynamics, both of which are key components in sex discrimination. For example, in addition to the hormonally influenced structural differences between men and women (e.g., broader shoulders and narrower hips in men compared to women), male walkers, as compared to female walkers, have a larger upper-body lateral sway (Mather & Murdoch, 1994), whereas women have a hip rotation that is in the opposite phase to vertical leg motion (Troje, 2003), resulting in more pronounced hip movement. Using point-light displays of biological motion, we investigated the unique effect of masculinity on attractiveness with fewer confounding variables. The first study investigated women's attraction to masculinity as a function of their female fertility, and the second study investigated women's attraction to masculinity as a function of their sociosexuality.

2. Study 1

2.1. Method

2.1.1. Participants—stimulus generation

Forty-four male (mean age=25.4, S.D.=7.9) and 48 female (mean age=19.8, S.D.=3.1) students participated in a separate study on sex differences in biological motion.

2.1.2. Participants—laboratory study

Participants were introductory psychology students. Fifty-five women not using hormonal birth control (NHBC) participated; however, 13 were removed because the late follicular phase (indicated by self-report of their menstrual cycle history and expected onset of next menses) was not confirmed through salivary ferning, and 3 additional women were removed because they did not self-identify as heterosexual. Thus, 39 NHBC women were included in the analyses (mean age=18.1, S.D.=0.67). In addition, 19 of these women did not participate at both cycle stages, leaving 20 women (mean age=17.9, S.D.=0.7) to be included in the repeated measures analyses. Twenty-four women using hormonal birth control (HBC) participated; however, we only included 19 (mean age=18.2, S.D.=0.8) because 5 did not self-identify as heterosexual; 70% of the participants were White.

2.1.3. Stimuli

The 44 male and 48 female walkers participated in a motion capture session. Participants wore a supplied suit attached with reflecting markers and had additional markers (to a total of 41) placed directly on the skin using a modified version of the Helen Hayes marker set (Davis, Ounpuu, Tyburski, & Gage, 1991). We recorded four walking trials from the 92 walkers using a 12-camera motion capture system (Vicon, Oxford Metrics). Participants were asked to walk across a 6-m-long motion capture field at their own pace. They were told to walk back and forth across the space until told to stop, until we eventually recorded two walks in each direction. Participants were unaware of which walks were recorded. The raw data were transformed into a linear, Fourier-based model and then simplified with a principal components analysis. Based on the first 10 Eigenwalkers, we created a function that represented an optimal linear classifier and reflected the differences between male and female walkers (i.e., a gender axis). To test the performance of the classifier, we used a cross-validation procedure that removed each walker individually, recalculated the classifier, and then classified the removed walker. The output was the number of misclassifications. Using a z test for differences in proportions, comparing the number of misclassifications to the null of 50% misclassifications, the gender linear classifier was able to accurately distinguish male from female walkers with 66% classification accuracy (z=3.15, p<.05). The gender axis was scaled in z scores (see Troje 2002a, 2002b) and was rendered as a morphable 15-dot point-light motion display in frontal view on a computer screen. It was possible to change the appearance of the walker by changing the z score of its position along the gender axis. z scores were presented along a continuum without limits. The walkers beyond about 15 z scores began to lose resemblance to natural walkers; however, no one indicated these walkers as the most attractive to them. The motion display changed instantaneously as participants changed the z score.

2.1.4. Procedure

Once informed consent was obtained, women completed a questionnaire about their use of hormonal contraceptives and timing of their menstrual cycle. If NHBC women were in the late follicular phase (14 to 16 days before their next menses) or luteal phase (5 to 7 days before their next menses), they participated at that time; otherwise, we rescheduled them to come back at the correct stage. NHBC women also provided a saliva sample to confirm fertility status. The estrogen peak following ovulation results in an increase of biosalts secreted by mucous membranes that, in turn, creates a ferning pattern in dried saliva. Salivary ferning is a fairly reliable way to confirm fertility status (Guida et al., 1999). HBC women participated on the day they came to the laboratory. Participants were shown the point-light walker on the computer screen, set at the mean position (i.e., z score of 0). We told the participants to change the appearance of the walker by changing a ticker's location along a slider bar and to use the interactive animation to find the position at which the walker appeared "most attractive to them." Although the z scores associated with the changing visualization were visible, no anchors or labels were supplied. Participants then recorded the z score associated with that walker. Finally, they filled out a brief demographic questionnaire.

2.2. Results

One NHBC woman gave a value for the most attractive walker greater than 2.5 standard deviations away from the mean value; thus, she was removed from further analyses. Using a one-sample t test, we compared the average z score indicated by women (both HBC women and NHBC women in either the late follicular or luteal stages during their first visit; mean=4.9, S.D.=1.9) as their most attractive walker to zero (the value of the average walker). There was an overall preference for male masculinity [$t(56)=18.6$, $p<.001$, $F=2.6$]. To ensure that ethnicity did not affect results, we performed a t test between White (mean=4.83, S.D.=2.11) and non-White (mean=4.95, S.D.=1.53) participants. There was no difference between the ethnic groups [$t(55)=0.21$, ns]. A one-way ANOVA between women in the late follicular stage during their first visit (mean=5.12, S.D.=1.96, $n=20$), women in the luteal stage during their first visit (mean=4.49, S.D.=1.95, $n=18$), and HBC women (mean=4.96, S.D.=1.99, $n=19$) indicated no difference between the groups [$F(2, 26)<1$, ns]. A paired t test showed that women in the late follicular phase (mean=5.02, S.D.=1.87), as compared to when they were in the luteal phase (mean=4.42, S.D.=2.14), preferred a higher level of masculinity [$t(19)=2.1$, $p=.05$, $d=.3$]. To ensure that order did not affect the results of the repeated measures test, we calculated a difference score by subtracting the discriminative value given as most attractive by women in the luteal phase from the score given in the late follicular phase and investigated the difference by group. Using confidence interval analysis, women who first did the task in the late follicular phase had a similar difference score from women who first did the task in the luteal phase (see Table 1 for means and bounds of 95% confidence intervals).

Table 1
Means of difference scores and 95% confidence intervals demonstrating that the difference scores between z scores given for the most attractive walker when women were in the late follicular phase versus luteal phase were similar for both groups

	Mean difference score	Lower bound	Upper bound
Late follicular first	0.78	−0.02	1.59
Luteal first	0.24	−0.85	1.33

2.3. Discussion

In this study, women overall preferred a masculine walker, and as expected, women in the fertile stage of their menstrual cycle preferred a more masculine walker than when they were in the nonfertile stage. The overall preference for masculinity replicates work done by Dixson, Halliwell, East, Wignarajah, and Anderson (2003) on body shape and relates to work done by Penton-Voak et al. (1999) on female preference for feminized male faces at times of low fertility. As with the face research, we found a preference for a more masculine stimulus at the time of peak fertility. Thus, gait contains information that is relevant to female mate choice, and as with faces, this information is contextually dependent on the female menstrual cycle. The next study investigated the effect of an interindividual difference, sociosexual orientation, on preference for masculinity.

3. Study 2

3.1. Method

3.1.1. Participants

Participants ($n=75$) from an introductory psychology course participated in the study for course credit. Women who self-identified as nonheterosexual ($n=7$) and women who did not complete the SOI ($n=2$) were excluded from the analysis, for a total of 63 participants (mean age=18.21, S.D.=1.14).

3.1.2. Procedure

Participants saw the same stimuli as in Study 1. We instructed participants to navigate the gender axis using a slider bar presented with the stimuli and pick the point-light walker they found most attractive. Women recorded the value of that walker and then completed the SOI questionnaire.

3.2. Results

Participants indicating values more than 2.5 standard deviations (with respect to the distribution of the subjects' ratings) away from the mean on most attractive masculinity and SOI ($n=1$ and $n=2$, respectively) were removed from the analysis. Values women gave for their most attractive walker

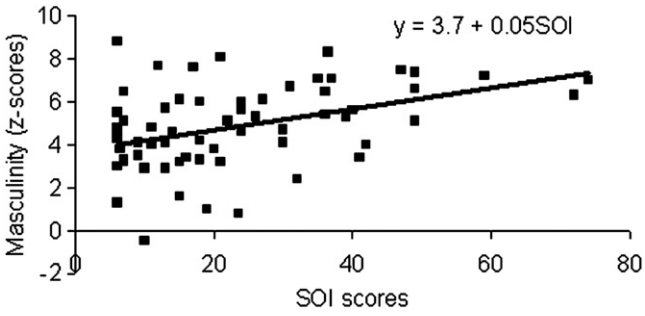

Fig. 1. Increasing SOI scores are associated with increased preference for high levels of masculinity, expressed in terms of the distance of a male walker from the gender-neutral walker.

were normally distributed (mean=4.88 *z* scores, S.D.=1.97). SOI scores (mean=23.60, S.D.=16.39) were slightly skewed; hence, they were submitted to a square root transformation. As predicted, women with higher SOI scores found men with high levels of masculinity to be most attractive (r=.40, p=.001; similar results were found with untransformed data, r=.41, p=.001; see Fig. 1).

3.3. Discussion

As predicted, women's openness to short-term mating affected their attraction to male masculinity, with unrestricted sociosexuality relating to preference for masculine walkers. Increases in openness to short-term mating are related to a decrease in the amount of nongenetic benefits that can be received from sexual partnerships. Highly masculine men are believed to have good immune systems due to their ability to simultaneously maintain health and high levels of testosterone; thus, male masculinity signals genetic benefits that are available to women. We therefore expected women open to short-term mating to indicate higher levels of attraction to men who could provide genetic benefits for their children.

4. General discussion

These studies demonstrated that women are attracted to high levels of masculinity in situations where short-term mating is more probable than long-term mating. In Study 1, women had a stronger preference for masculinity when they were fertile than when they were not. In Study 2, openness to short-term mating, measured through sociosexual orientation, also was related to preference for masculinity. Because women, on average, entered values in the masculine end of the gender continuum, we believe that the influence of female fertility status and sociosexual orientation on specific masculinity level reflects a preference for higher masculinity, not just a preference for a masculine walker compared to a feminine walker. In addition, because the presented stimulus was a point-light walker on the screen, we are confident that these results show preference for masculinity and are less confounded than previous research investigating preference for masculinity by other possible variables such as age, ethnicity, or health. The use of point-light displays of biological motion, therefore, may be an interesting tool for investigating female preference for other traits, for example, social dominance. It is important to investigate the role gait plays in nonverbal communications. In particular, in what circumstances would gait be informative and how much information does it supply compared to other cues? The amount of control that people have over their gait is also unknown. How gaits change and how others view the changes depend on circumstances (e.g., is a man going to walk differently in front of numerous women than if he is walking on his own? How would a woman rate a recording of such a gait?). Point-light gait displays provide the methodology to investigate these questions.

However, point-light displays also have their drawbacks. As with any stimulus generation that creates a continuum along a given dimension from a discrete group of individuals, it is possible to generate examples of stimuli that do not exist in the natural environment. In addition, walks were obtained from 44 men to generate the stimulus, and it is unlikely that these men encompass the entire natural range of walking masculinity in the world. Thus, it is possible that the stimuli are not ecologically representative. However, it is unlikely that the masculinity and femininity of actual walkers are a discrete function. Even if the participants in this study have not encountered every walker along the presented continuum in their actual life, they would still be able to make judgments along the axis. Likewise, the 44 men who were used to generate the stimuli provided enough of a contrast from the women walkers to create a function that could be extrapolated to a wide range of masculine walkers. Thus, although participants may not have indicated preferences for the masculinity levels of walkers they regularly encounter, they still indicated preferences for variations in masculinity.

However, the operational definition of masculinity in this study also requires that the results be interpreted with caution. In these studies, women manipulated the appearance of motion that was created by contrasting male and female walkers, and the results are consistent with the theoretical predictions that include the assumption that masculinity in gait is associated with testosterone. However, we have no evidence that sex-typical walking pattern is related to levels of circulating or developmentally pertinent sex-typical hormones. Thus, we do not know if women prefer more masculine walkers or simply prefer less feminine walkers. Although the structural effects of sex hormones are known, there is limited research on the role of hormones on the dynamic aspect of walking. Further research needs to investigate the influence of hormonal levels on walking patterns specifically, as well as how the hormonally influenced morphology of a person affects the way people walk.

In addition, the results from Study 2 support the notion that individual differences such as sociosexuality are part of

women's pluralistic strategies. There is further research necessary to hash out this role. In particular, what is the cost/benefit ratio of engaging in short-term relationships versus long-term relationships for women with an unrestricted sociosexual orientation? In addition, if sociosexual orientation is a facultative mating strategy, what are the ontogenetic processes involved in developing and maintaining this strategy? Further theoretical and empirical work must be done to further investigate the role of sociosexuality in human life history strategies.

Overall, these studies demonstrate that women who are likely to engage in short-term relationships (i.e., women in the late follicular phase of their menstrual cycle or women with relatively unrestricted sociosexuality) are attracted to masculinity as presented through point-light displays of biological motion. Although the displays may not represent actual male walkers, they do demonstrate that women who are expected to be more interested in obtaining genetic benefits from a romantic liaison prefer displays of masculinity. Thus, these studies both supported and expanded research on the strategic pluralism model of female mating strategies while demonstrating the usefulness of biological motion as stimuli to investigate interpersonal attraction.

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