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Abstract

Sexual selection may have shaped male visual sensitivity to characteristics that provide information about female mate quality. Indeed, men judge certain facial and bodily configurations of women to be attractive, possibly because those configurations signal health and fertility. Most of this evidence derives from the study of women’s facial and body photographs. We tested the hypothesis that attractive female dancers receive greater visual attention from men than do unattractive dancers. Twenty-nine men viewed video pairs of pre-categorized high and low attractive female dancers. Their eye gaze was tracked and they also provided ratings of attractiveness, femininity, and dance movement harmony. High attractive dancers received greater visual attention than did low attractive dancers and men’s visual attention correlated positively with their judgments of attractiveness, femininity, and dance movement harmony. We discuss our findings in the context of the ‘beauty captures the mind of the beholder’ hypothesis and the role of dance movements in human mate selection.

Keywords: body movement, dance attractiveness, visual attention, eye tracking, dance movement harmony.

Highlights

- Men’s visual attention to female dance movements
- Men spend higher visual attention to dance movements of attractive female dancers
- Men judged attractive dancer higher on femininity and dance movement harmony
- Men’s visual attention correlates positively with attractiveness assessments

1. Introduction

Men across cultures prioritize health and youth in a prospective opposite-sex partner and judge these characteristics as attractive, possibly because these traits indicate mate quality (Buss & Schmitt, 1993). Studies investigating men’s attractiveness perceptions of women have primarily used facial and body photographs, but recent research suggests that women’s body movements may also be associated with similar mate quality information (Fink, Weege, Neave, Pham & Shackelford, 2015).

Grammer and colleagues (2003) reported that men judged women’s gait recorded during high fertility as more attractive than gait recorded during low fertility. Miller, Tybur, and Jordan (2007) found that female lap dancers received higher tip earnings during high fertility days than during low fertility days, and Fink, Hugill, and Lange (2012) showed, that men judged female dancers as more attractive on fertile (relative to non-fertile) cycle days. These findings suggest that men are sensitive to cyclic variations in women’s body movements, which in turn affect their attractiveness assessments.

Additional evidence is provided by research investigating the effect of mating context on men’s perception of women’s dance movements. Röder, Weege, Carbon, Shackelford, and Fink (2015) found that high attractive female dancers were rated as more promiscuous than low attractive dancers, especially when male judges were instructed to assess these women as short-term sexual partners. High attractive dancers were rated higher on dance movement harmony and as healthier than their less attractive counterparts. Specifically, men’s promiscuity judgments of female dancers predicted ratings of the dancers’ attractiveness as a short-term sexual partner, whereas movement harmony judgments predicted ratings of dancers’ attractiveness as a long-

term partner. These findings suggest that context-related differences in men's perceptions of women's dance attractiveness exist and may be produced by adaptations that motivate increased attraction toward healthy and fertile women.

Eye-tracking research has shown that certain physical characteristics capture men’s visual attention and that men look longer and more often at female faces (Maner, DeWall & Gailliot, 2008) and bodies (Dixson, Grimshaw, Linklater & Dixson, 2009) that they consider attractive. Thus, researchers suggested that mating-related motives may guide selective visual attention to and processing of attractive and unattractive faces (“beauty captures the mind of the beholder” hypothesis: Maner, Kenrick, Becker, Delton, Hofer, Wilbur & Neuberg, 2003). Weege, Lange, and Fink (2012) found that women devoted greater visual attention to dance movements of men they judged as more attractive. They concluded that a cognitive bias towards attractiveness, similar to that proposed for face perceptions (Maner et al., 2003), may exist for women’s perception of men’s body movements.

Here, we investigated men’s visual attention to and assessments of women’s dance movements and hypothesized that dance movements of ‘high attractive’ female dancers would receive greater visual attention than movements of ‘low attractive’ dancers. Moreover, we expected positive relationships between measures of men’s visual attention and their assessments of attractiveness, femininity, and movement harmony of these same female dancers.

2. Materials and methods

2.1 *Stimuli*

Our stimuli comprised 10 dance characters, selected from a set created as part of a larger-scale project on human body movement (e.g., Hufschmidt, Weege, Röder, Pisanski, Neave & Fink, 2015; Fink, Weege, Neave, Ried & do Lago, 2014; Fink et al., 2015; Weege, Pham, Shackelford & Fink, 2015). Dance movements of 84 British women aged 18 to 41 years (*M* = 20.6 years, *SD* = 3.8) were collected using 3D-optical motion capture technology (Vicon, Oxford, UK) and applied to a shape-standardized, featureless, gender-neutral, humanoid character using Autodesk MotionBuilder (Autodesk Inc., San Rafael, CA, USA). A 10-second sequence was extracted from the middle of each dance recording and rendered into a video with a resolution of 784 x 640 pixels at a frame rate of 24 fps.

In a pre-study, 49 heterosexual men aged 19 to 30 years (*M* = 23.7 years, *SD* = 3.8) judged the attractiveness of the 84 dance characters on a 7-point Likert scale (1 = *very unattractive*, 7 = *very attractive*) using MediaLab software (Empirisoft Inc., New York, USA). On the basis of mean attractiveness ratings, the five most attractive and the five least attractive dancers were selected for presentation in the main study. Attractiveness ratings differed significantly between the two sets (high attractive: *M* = 5.03, *SD* = 0.17; low attractive: *M* = 1.92, *SD* = 0.14; independent samples *t*-test, one-tailed $t_{(8)} = 32.02$, $p < .001$, $d = 20.18$).

2.2 *Participants*

Twenty nine men, aged 20 to 39 years (*M* = 24.4 years, *SD* = 4.7) were recruited mainly from the local university campus. Participants completed a standard Snellen eye

chart test confirming good visual acuity. They provided written consent and were debriefed following both tasks.

2.3 *Procedure*

A set of 25 video pairs was created by combining one video from the group of high attractive dancers with one video from the group of low attractive dancers, counterbalanced with regard to the side of presentation. Video pairs were presented on a 22″ monitor (1680 x 1050 pixels resolution) at a size of 1280 x 1024 pixels. For each video pair, two areas of interest (AOIs) were defined (SR ExperimentBuilder software, SR Research, Canada), covering the entire size of the video of the high attractive and the low attractive dancer, respectively (see for a similar approach Weege et al., 2012). Within these AOIs, visual attention was measured as cumulative dwell time (in ms) and number of fixations (EyeLink 1000, SR Research, Canada).

Subsequent to an automatic calibration sequence the 25 video pairs were presented to participants in randomized order. Prior to each video pair, a blank screen (10 s) and a fixation cross (1.5 s) were presented to ensure a constant starting position of gaze. After completing the eye-tracking task, participants rated the dancers on attractiveness, femininity, and dance movement harmony on a 7-point Likert scale (1 = *not at all attractive/feminine/harmonic*, 7 = *very attractive/feminine/harmonic*). Videos were presented individually, blocked by attribute and in a randomized order.

Means of visual attention measures and attractiveness, femininity, and dance movement harmony ratings were calculated for the five high and the five low attractive dancers separately (descriptive statistics Table 1). To ascertain differences in visual

attention and ratings between high and low attractive dancers, difference scores were calculated by subtracting the means of high attractive dancers from those of low attractive dancers, and tested against zero (i.e., the assumption of no significant difference between the groups). All statistical tests were performed one-tailed and with an error level set to .05.

3. Results

One-sample Kolmogorov-Smirnov goodness of fit tests indicated that the difference scores were normally distributed ($Zs_{(29)} \geq .10$, $ps \geq .16$, *n.s.*). Cronbach's alpha coefficients for men's attractiveness, femininity, and harmony judgments of female dancers were all ≥ .98.

One-sample *t*-tests revealed a significant result for dwell time ($t_{(28)} = 8.72$, $p < .001$, $d = 2.96$) and number of fixations ($t_{(28)} = 8.39$, $p < .001$, $d = 3.17$). We also found significant effects for ratings of attractiveness ($t_{(28)} = 13.53$, $p < .001$, $d = 5.11$), femininity ($t_{(28)} = 17.21$, $p < .001$, $d = 6.50$), and dance movement harmony ($t_{(28)} = 10.40$, $p < .001$, $d = 3.93$). Thus, men devoted greater visual attention to high attractive dancers and judged them higher on attractiveness, femininity, and dance movement harmony, compared to low attractive dancers.

Men's visual attention correlated positively with their ratings of attractiveness (dwell time: $r_{(27)} = .35$, $p < .05$; number of fixations: $r_{(27)} = .45$, $p < .01$) and dance movement harmony (dwell time: $r_{(27)} = .41$, $p < .05$; number of fixations: $r_{(27)} = .44$, $p < .01$). Ratings of femininity correlated positively with number of fixations ($r_{(27)} = .32$, $p < .05$) and dwell time ($r_{(27)} = .21$, $p = .14$), although the latter correlation did not reach

statistical significance. Dwell time and number of fixations correlated positively ($r_{(27)}$ = .81, p < .001).

--- Insert Table 1 about here ---

4. Discussion

Our results show that men devote more visual attention (looked longer and more frequently) to pre-categorized attractive female dancers compared to those pre-categorized as less attractive, and judge them higher on attractiveness, femininity and dance movement harmony (although the relationship between dwell time and femininity judgments did not reach statistical significance). This suggests that dance movements of high attractive female dancers differ in certain properties from those of low attractive dancers, and men are not only visually attracted to the moves of high attractive dancers, but also judge them more positively.

These findings sit comfortably alongside other research suggesting that body movements convey certain quality information that influences men's and women's mate preferences. Johnson and colleagues (2007) reported that gender-atypical gait movements affect perceptions of sexual orientation of women and, the accuracy of sexual orientation assessments. Computer-generated walkers with lower waist-to-hip ratios and displaying more pronounced hip sways were categorized as heterosexual women, whereas the same walkers displaying shoulder swaggers were categorized as homosexual women. Thus, body movement seems to contain gender-typical cues that vary within and between the sexes. Hufschmidt et al. (2015) presented virtual characters, animated with the dance movements of men and women to children and adults. Although gender-identification performance was higher than expected by chance

for both groups, physical strength predicted performance only in adults, suggesting that information about a sexually dimorphic feature (strength) is also conveyed through dance movements.

Women’s dance movements may signal properties of mate quality, and we speculate that it is primarily those qualities predicted by the Sexual Strategies Theory (Buss & Schmitt, 1993), i.e., fertility and health. Research on ovulatory-cycle dependent variation in men’s responses to women’s body movements provides support for the notion of a relationship between women’s body movements and fertility (Miller et al., 2007; Fink et al., 2012). With regard to health, the situation is less clear. However, we reported previously that movement harmony judgments of women’s dances correlated with health perceptions (Röder et al., 2015). Moreover, perceived dance movement harmony predicted attractiveness ratings, especially in a long-term mating context, whereas promiscuity ratings predicted the short-term attractiveness of dancers.

We found that men devote greater visual attention to female dancers whose body movements they judge as more harmonic. Although male observers seem to share a certain taste in their preferences, it is not clear which characteristics of female body movements elicit judgments of dance movement harmony. Perhaps this assessment captures aspects of body movements that indicate physical health and emotional wellbeing (Hanna, 2006). To quantify female dance movements objectively through, for example, a kinematic/biomechanical analysis is an avenue for future research. This would enable researchers to disentangle aesthetic cues from sexual cues, as dance movements may convey both, and to investigate their relationships with health and

wellbeing, in addition to sexual information that men derive from women's dance movements.

Previous research on female face and body attractiveness suggests that sexual selection may have shaped men's mate preferences and perceptual mechanisms to be sensitive to certain quality cues of a potential mate. Maner et al. (2003) demonstrated that observers were selectively attuned to physically attractive individuals. Men and women exhibited higher visual attention to attractive compared to unattractive faces of women, whereas only women showed this bias for male faces. Considering the results of the present study and those of Weege et al. (2012), we suggest that a cognitive bias in the perception of dance movements exists in both sexes and is informed by mating-related motives.

What might be the evolutionary benefits of visual sensitivity and attention to sex-specific quality cues that men derive from female body movements? People seem to be quick in their initial assessment of what they consider attractive or unattractive (which is consistent with the results of cognitive as well as neurobiological studies), and look longer on what they evaluate as positive. Despite the short presentation time of each pair of dancers, it is likely that observers made a quick initial decision on the quality of the dancers' body movements. However, whether humans rely on initial brain processes during mate selection, which may be 'biased' in the form of selective attention to opposite sex-typical cues, remains an open question.

An interesting question in this context is whether dance movements can be regarded as 'honest cues' to an individual's mate quality, as has been proposed for faces and bodies (Thornhill & Grammer, 1999). If this were so, we would expect that the

quality information men derive from women’s body movements is reliable, in that body movement cues cannot be easily faked. Thus, dance movements should comprise developmental information and be linked to an individual’s health. In this view, attractive dances are displayed by individuals who can afford the ‘production’ of a complex motor behavior such as dance, which requires the coordination of physical, biomechanical and neurological structures. Whether personal information conveyed through dance movements can be consciously altered to elicit a different response in observers (e.g., a more positive attractiveness assessment) has yet to be demonstrated.

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Table

Table 1: Descriptive statistics of men's visual attention toward and ratings of women's dance movements.

	High attractive dancers		Low attractive dancers	
	M	*SD*	*M*	*SD*
Dwell time (ms)	5,597.4	892.3	2,791.4	913.9
Number of fixations	10.94	2.24	6.67	1.91
Attractiveness	4.83	0.76	2.32	0.88
Femininity	5.32	0.75	2.34	0.74
Movement harmony	4.99	0.88	2.61	0.97

Note: All means (*M*) and standard deviations (*SD*) are based on $n = 29$ male observers.