MOVES LIKE JAGGER: MULTIDIMENSIONAL ATTRACTIVENESS RATINGS OF OPPOSITE-SEX DANCERS

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Abstract

Research has shown that a number of factors, including body symmetry, perceived strength, vigour, skilfulness, and agility of movements, as well as increased variability and amplitude of the neck and trunk, can affect the attractiveness of dance moves. Perceived femininity/masculinity of body movement likely also plays a role. Here, we compare comprehensive ratings of both male and female dancers' opposite-sex attractiveness, including ratings of femininity/masculinity, with computationally-extracted movement features. Sixty-two heterosexual adult participants watched 48 short audio-visual point-light animations of eight male and eight female adults dancing individually to Techno, Pop, and Latin music. Participants rated perceived *Femininity/Masculinity* (as appropriate), *Sensuality*, *Sexiness*, *Mood*, and *Interestingness* of each dancer. Seven kinematic and kinetic features – *Downforce*, *Hip wiggle*, *Shoulder vs. hip angle*, *Hip-knee phase*, *Shoulder-hip ratio*, *Hip-body ratio*, and *Body symmetry* – were computationally extracted from the stimuli. A series of correlations revealed that, for men watching women, *Hip-knee phase angle* was positively related to *Interestingness* and *Mood*, and that *Hip-body ratio* was positively related to *Sensuality*. For women watching men, *Downforce* was positively related to *Sensuality*. Our results highlight some interesting similarities and differences between male and female perceptions of attractiveness of opposite sex dancers.

Keywords: Dance, Attraction, Gender

1. Introduction

In our search for potential mates, our initial impression of them is often based upon an analysis of their movement patterns as opposed to static form cues (Grossmann & Blake, 1999; Montepare & Zebrowitz-McArthur, 1988; Pavlova, Krägeloh-Mann, Birbaumer, & Sokolov, 2002). This is especially true when considering the typical situation in a nightclub, where variable and often dim lighting conditions, as well as frequent occlusions caused by other dancers, people passing by, etc., are the norm. Thus, it is likely that the way a person dances will influence how others perceive them, including how attractive they are considered to be.

Charles Darwin (1872) was one of the first to observe that dynamic cues are more useful than static cues when attempting to understand others. Indeed, humans are highly social creatures, and constantly gather information about other people's intentions from their gestures and expressions (Blake and Shiffrar, 2007; Troje, 2003). The fact that so-called point-light displays (Johansson, 1973, 1976) are only interpretable when the dots are in motion further supports the view that motion cues are crucial in understanding another's actions. A large body of work has confirmed that humans are sensitive to biological motion, and that such sensitivity

is probably an innate capacity of the visual system (e.g., Fox and McDaniel, 1982; Kuhlmeier, Troje & Lee, 2010; Moore, Goodwin, George, Axelsson, & Braddick, 2007; Norman, Payton, Long, & Hawkes, 2004; Pavlova, Krägeloh-Mann, Birbaumer, and Sokolov, 2001; Piotrowski, Jakobson, &Troje, 2007; Simion, Regolin & Bulf, 2008; Stevenage, Nixon, & Vince, 1999).

Research has shown that we can derive a huge amount of information about a person from their movement characteristics. In terms of physical properties, for example, we can detect a person's sex (e.g., Barclay, Cutting, & Kozlowski, 1978; Kozlowski & Cutting, 1977, 1978; Mather & Murdoch, 1994; Sumi, 2000; Troje, 2002), age (e.g., Montepare & Zebrowitz-McArthur, 1988), size (Jokisch & Troje, 2003; Troje, 2003), and even their identity (e.g., Cutting & Kozlowski, 1977; Hill & Pollick, 2000; Loula, Prasad, Harber, & Shiffrar, 2005; Stevenage et al., 1999; Troje, Westhoff, & Lavrov, 2005; Westhoff & Troje, 2007) from the way they move their body.

We are also able to infer certain qualities about a person based upon the way they move. Such qualities include their emotional state (Atkinson, Dittrich, Gemmell, & Young, 2004; Brownlow, Dixon, Egbert, & Radcliff, 1997; Clarke, Bradshaw, Field, Hampson, & Rose, 2005; Dittrich Troscianko, Lea, & Morgan, 1996; Pollick, Patterson, Bruderlin, & Sandford, 2001; Walk & Homan, 1984), sexual orientation (Ambady, Hallahan, & Conner, 1999), intent to deceive (Runeson and Frykholm, 1983), and whether or not they're depressed (Lemke, Wendorff, Mieth, Buhl, and Linnemann, 2000; Sloman, Berridge, Homatidis, Hunter, and Duck, 1982).

In terms of body movement and attraction, research has revealed that, when opposite sex strangers meet for the first time, interest in the other is often indicated by the frequency and quality of bodily movements. Grammer (1990), for example, found that women tended to make eye contact then look away, and use particular postures and gaits to signal their interest in men. A positive relationship between frequency of these behaviours and approach incidence was subsequently identified.

Moreover, amplitude and speed of these signalling behaviours is also important. Situations in which women signal their interest in men by moving more frequently, but with smaller amplitude and slower speed, are judged by men to be more positive and pleasant (Grammer, Juette, Schmitt, & Honda, 1999). Thus, attractiveness is influenced not only by the type of movement or posture made, but also the quality of that movement or posture.

More recent work has extended these ideas to the attractiveness of dance movements to the opposite sex, revealing that perceived attractiveness of dance activity correlates with certain aspects of an individual's mate quality (Brown et al., 2005; Hugill, Fink, Neave, & Seydel, 2009). Brown et al. (2005), for example, found that body symmetry, an indicator of genetic quality, plays a significant role in women's attractiveness ratings of men, with more symmetrical men being rated as more attractive dancers. Brown et al. (2005) further hypothesise that symmetry is an important factor in female attraction. Hugill et al. (2009) propose a number of factors evident in dancing which provide information about an individual's mate quality in terms of health and strength. A more recent study by Neave et al. (2010) identified three movement features of male dance moves which predicted females' ratings of dance quality: Variability and amplitude of neck movement, variability and amplitude of trunk movement, and speed of movements of the right knee. Neave et al. (2010) suggest that these movements were signs of dancer health, vigour and strength.

For women watching men, then, body symmetry, perceived strength, vigour, skilfulness, and agility of movements, as well as greater variability and amplitude of the neck and trunk, are positively related to ratings of attractiveness. For men watching women, body symmetry is also rather important.

Attractiveness is also likely related to perceived femininity/ masculinity of movement. Perceived femininity of human movement in general is positively related to shoulder-hip movement ratio (Cutting, 1978), shoulder-hip width ratio (Cutting, 1978; Barclay, Cutting, & Kozlowski, 1978; Cutting, Proffitt, & Kozlowski, 1978), height of centre of gravity

(Cutting, 1978), lateral sway of the upper body (Mather & Murdoch, 1994), and anti-phase vertical movement of the hip compared to the ipsilateral knee and foot (Troje, 2002), and negatively related to both height of centre of movement (Cutting, 1978) and lateral hip movement (Murray, Kory, & Sepic, 1970; Cho, Park, & Kwon, 2004; Smith, Lelas, & Kerrigan, 2002) (relationships are reversed for perceived masculinity).

However, comprehensive data concerning ratings of both male and female dancers' opposite-sex attractiveness, including ratings of femininity/masculinity, appear never to have been collected in the same study. The aim here was to directly compare characteristics of attractive opposite sex dancers under the same conditions. We were interested specifically in 1) the kind of dance moves which appeal to men and women, and how, if at all, they differ between the sexes, and 2) the kinds of personal characteristics people attribute to different dancers based purely on the way they move.

To this end, we presented participants with a series of point-light movies of people dancing to music. Participants rated perceived *Femininity/Masculinity* (as appropriate), *Sensuality*, *Sexiness*, *Mood*, and *Interestingness* of each dancer on a series of 7-point Likert scales. We also collected pertinent background information, such as gender, dance experience, and relationship status via a comprehensive questionnaire. A range of applicable structural and kinematic features – *Body symmetry*, *Hip-body ratio, Shoulder-hip ratio, Hip-knee phase angle*, *Shoulder-hip angle*, *Hip wiggle*, and *Downforce* – were formulated, computationally extracted from the dancers' movement data, and subsequently correlated with participants' ratings of the five dimensions above.

Based on previous work, we predicted that *Femininity* would be positively related to *Shoulder-hip movement angle*, *Shoulder-hip width ratio*, and *Hip-knee phase angle* (all negatively for *Masculinity*), that *Sensuality* would be positively related to *Femininity* ratings, that *Sexiness* would be in some way related to hip movement (non-directional), that *Mood* would be positively related to *Downforce*, and that *Interestingness* would be positively related to variety of movement in general.

2. Method

2.1. Participants

Sixty-two heterosexual adults (mean age = 24.68 years, 34 females) participated in the present study in return for a movie ticket.

2.2. Stimuli and procedure

Each participant was presented with 48 short (30 s) audiovisual point-light animations of adults dancing to music. Stimuli were comprised of eight males and eight females, each dancing to three songs representative of Techno, Pop, and Latin genres. Presentation was via an Apple iMac computer and a specially-written Max/MSP patch. During presentation of each stimulus, participants responded to five questions regarding perceived characteristics of each dancer: 1) How masculine or feminine (as appropriate) is their dancing? 2) How sensual is their dancing? How sexy is their dancing? 4) How good a mood are they in? 5) How interesting a person are they? Responses were given via seven-point Likert scales. Participants were able to repeat each stimulus as many times as they wished. After answering all questions for each stimulus, they moved onto the next.

3. Results

3.1. Feature extraction

The following seven structural and kinematic features were computationally extracted from the stimuli:

1. *Body symmetry*: Sum of absolute differences between contralateral body segments.
2. *Hip-body ratio*: Ratio between hip width and body height.
3. *Shoulder-hip ratio*. Ratio between shoulder width and hip width.
4. *Hip-knee phase angle*: Degree of synchrony between the vertical movement of the hip and knee (averaged between the left and right sides).

5. *Shoulder-hip angle*. Mean absolute difference between the lateral tilt angles of the shoulder segment and the hip segment.
6. *Hip wiggle*. Mean absolute angular velocity of the hips around the anteroposterior axis.
7. *Downforce*: Skewness of the distribution of the vertical component of instantaneous speed of the root marker.

These features were considered most relevant to perceived attractiveness based on previous work in this area. Mean values of each feature for each stimulus were subsequently correlated with mean ratings of perceived *Femininity/Masculinity*, *Sensuality*, *Sexiness*, *Mood*, and *Interestingness* of the dancers, separately for men watching women and women watching men. Correlation coefficients of the two groups are shown in **Table 1** and **Table 2**.

It can be seen from **Table 1** that, for men watching women, ratings of *Mood* and *Interestingness* were both negatively related to the dancers' *Hip-knee phase angle*. In other words, female dancers perceived as both more interesting and in a better mood had a lower degree of synchrony between vertical movement of their hips and knees. It can also be seen from **Table 1** that male ratings of female dancers' *Sensuality* was positively related to their *Hip-body ratio*.

Table 2 reveals that, for women watching men, ratings of *Sensuality* were positively related to *Downforce*, a measure of 'bounciness' of dancers' movements. This suggests that male dancers who dance in a bouncier, lighter, fashion are perceived by women as being more sensual. Interestingly, greater push-off force or 'bounciness' has been identified as an indicator of more positive mood in other studies (e.g., Sloman, Pierrynowski, Berridge, Tupling, & Flowers, 1987; Troje, 2008). Its relationship to male sensuality in the present study is unclear.

As regards other prominent but statistically non-significant correlations, several are worth noting. For men rating female dancers, there were positive relationships between *Femininity*, *Sexiness*, and *Mood* and *Hip-body ratio*, and negative relationships between *Femininity*, *Sensuality*, and *Sexiness*, and *Hip-knee phase angle*. This suggests that these two features are most strongly related to female dancer attractiveness in general. For women rating male dancers, there were positive relationships between *Sexiness*, *Mood*, and *Interestingness* and *Downforce*, and negative relationships between *Sensuality* and *Hip-body ratio* and *Hip-knee phase angle*, as well as between *Mood* and *Hip-body ratio*. Downforce is thus likely a good indicator of male dancer attractiveness in general.

Table 1. Correlation coefficients between the seven movement features and mean ratings of perceived *Femininity*, *Sensuality*, *Sexiness*, *Mood*, and *Interestingness*, for men watching women.

	Femininity	*Sensuality*	*Sexiness*	*Mood*	*Interest.*
Body symmetry	0.156	0.163	0.195	0.201	0.243
Hip-body ratio	0.354	.407*	0.298	0.385	0.194
Shoulder-hip ratio	0.071	0.027	0.029	0.02	-0.063
Hip-knee phase angle	-0.389	-0.384	-0.352	-.486*	-.411*
Shoulder-hip angle	0.239	0.188	0.183	0.209	0.07
Hip wiggle	0.192	0.138	0.172	0.175	0.054
Downforce	0.196	0.207	0.127	0.172	0.014

*Correlation is significant at the 0.05 level.

Table 2. Correlation coefficients between the seven movement features and mean ratings of perceived *Masculinity*, *Sensuality*, *Sexiness*, *Mood*, and *Interestingness*, for women watching men.

	Masculinity	*Sensuality*	*Sexiness*	*Mood*	*Interest.*
Body symmetry	0.003	-0.057	-0.042	-0.060	-0.034
Hip-body ratio	-0.018	-0.285	-0.188	-0.212	-0.141
Shoulder-hip ratio	-0.001	0.049	0.025	0.038	-0.027
Hip-knee phase angle	-0.004	-0.241	-0.147	-0.115	-0.079
Shoulder-hip angle	0.187	-0.025	-0.023	-0.002	-0.025
Hip wiggle	0.242	-0.024	-0.003	0.030	0.027
Downforce	0.064	0.412*	0.312	0.266	0.236

*Correlation is significant at the 0.05 level.

4. Discussion and conclusions

This study represents the first time attractiveness ratings of opposite-sex dancers have been collected for both males and females under the same conditions, and highlights some interesting similarities and differences between male and female perceptions of attractiveness. We found that, for men watching women, *Hip-knee phase angle* was positively related to *Interestingness* and *Mood*, and that *Hip-body ratio* was positively related to *Sensuality*. For women watching men, *Downforce* was positively related to *Sensuality*. Other prominent but non-significant correlations supported the view that these three features are relevant to ratings of female and male dancers' attractiveness in general.

The lack of other significant correlations, however, was disappointing. There are a number of potential reasons why this may have been the case. First, it is possible that the stimuli presented here were not sufficiently diverse in terms of their attractiveness to illicit a wide enough range of responses from participants. Second, the analysis of global mean values as opposed to, say, time-series values, including continuous-response ratings, may have clouded the relationships between attractiveness ratings and structural/movement features.

Another possibility is that, relationships between attraction dimensions and structural/movement features were not linear, rendering correlational techniques useless. In addition, the attractiveness rating scales selected may not have been optimal, and participants may have found it hard to assess such dimensions from point-light stimuli.

Moreover, the structural and kinematic features extracted and analysed may not have adequately described the form and motion of the dancers presented to participants. Finally, there is the chance that it is simply not possible to rate dancers' attractiveness from point-light representations regardless of the stimuli, analysis techniques, rating scales, and features selected.

In conclusion, we encourage other researchers to develop the techniques and ideas advanced in this study in the hope of more clearly identifying features of dancing which relate to attractiveness.

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