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Body Posture and the Feeling of Social Closeness: An Exploratory Study in a Naturalistic Setting

Alexander Tomei · Jeremy Grivel

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Abstract Previous research has shown that body postures and body movements influence people's attitudes, preferences and feelings. In the present study, we explored the influence of body posture on the feeling of closeness towards others and how this effect may interact with contextual variables. Study 1 was conducted in a naturalistic setting in which 127 participants observed a series of live dance sequences either standing up or remaining seated. After each sequence, participants reported the feelings elicited by the dance performance on a questionnaire. Visibility of performers' facial expressions and background tempo were used as contextual variables. Results showed that participants who watched the performance standing up felt significantly closer to the dancers than participants who remained seated. Study 2 was carried out in a laboratory setting to explore the relationship between body posture, tempo and heart rate. Results showed a significant increase in heart rate when standing compared to when sitting and no effect of tempo. The present research demonstrates a link between body posture and social connection providing evidence that standing up strengthens the feeling of closeness to others, and showing that posture not only has an impact on self-related feelings (e.g. fear, anger, sadness) as previous research has shown, but also has an impact on feelings towards others at the base of all human social relations. The present research also suggests that heart rate may be a mediator of the effect of posture on the feeling of closeness.

Keywords Body posture · Tempo · Heart rate · Social closeness

Introduction

Embodied cognition theories have emphasized the role of the motor system in influencing psychological processes (see Niedenthal et al. 2005). More precisely, body movement and posture are now well known predictors of individual attitudes, preferences,

A. Tomei (✉) · J. Grivel
Community Psychiatry Service, Lausanne University Hospital, Rue St-Martin 7, 1003 Lausanne, Switzerland
e-mail: alexander.tomei@chuv.ch

and feelings. Wells and Petty (1980) led subjects to believe they were testing headphones, and instructed them to move their heads either vertically or horizontally while they listened to music and to a university broadcast message about tuition fee increases. Subjects who nodded their head up and down while listening to the broadcast perceived its message more favorably than subjects who shook their head horizontally. In the same vein, Tom et al. (1991) instructed subjects to listen to music through a headphone set and move their head either up and down or from side to side. The experimenter purposely left a pen on the table in front of the subjects for the duration of the session. Once the session was over, the subjects were offered a pen as a gift. They were given a choice between the pen they had seen on the table and an unfamiliar pen. Subjects who moved their head up and down chose the pen they had during the session more often than the unfamiliar pen. Conversely, subjects instructed to move their head from side to side were more likely to select the unfamiliar pen. Cacioppo et al. (1993) found that subjects judged ideographs to which they were exposed during arm flexion (movement intended to move the arm towards oneself) more positively than ideographs to which they were exposed during arm extension (movement intended to move the arm away from oneself), and that arm flexion was associated with an approach motivational orientation. To summarize, these studies demonstrate that producing body movements that embody cognition of approval/disapproval and approach/withdrawal influence our attitudes and preferences, even though such movements are unconnected to their first meaning.

Other studies have demonstrated that body posture influences how feelings are modulated. For instance, Duclos et al. (1989) showed that when people adopt postures of fear, anger or sadness without realizing the direct association with the emotion, they rate the intensity of the emotion congruent with their posture higher than the intensity of emotions that were not reflected in body posture during rating. In Stepper and Strack's study (1993), subjects completed an achievement test; subjects instructed to sit in an upright posture felt prouder on receipt of bogus positive feedback about test results than the subjects who sat in a slumped posture. These findings demonstrate the impact of body postures on self-related attitudes and self-related feelings (i.e. fear, anger, sadness, amusement, pride), so the purpose of this work is to examine the possible impact of body posture on other-related feelings (i.e. social connection).

One basic social feeling that we manifest towards people is the feeling of closeness. Social closeness is a deeply rooted natural human need. From earliest childhood the reciprocal, ongoing search for closeness is essential for the emotional, cognitive and social development of the human being (Bowlby 1958; Harlow and Zimmermann 1958). The affectional tie that people form with one another (Ainsworth and Bell 1970) finds its basis in the close and safe space between infant and mother, and in this close space the attunement between the child and its mother (Stern 1985) is generated as the starting point for the building and maintaining of social bonds through empathy (Anderson and Keltner 2002). In life beyond infancy, we tend to approach people we like by getting physically closer to them, and avoid people we dislike by keeping at a physical distance. Metaphorically, we indicate the strength of social connection with others in terms of distance by employing expressions such as 'feeling close to someone' or 'being close friends' (Meier et al. 2012).

We hypothesized that the feelings of social connection may be determined by standing up from a seated posture. In social situations - at least in Western cultures –

standing up is inherently a social posture in that it anticipates the connection with people we happen to meet or desire to meet. The effect of a change in body posture on psychological distance independent of physical distance has not been investigated to date. We therefore decided to investigate the effect of posture - seated or standing - on socially related feelings. In the present research we tested the hypothesis that other-related feelings, such as social closeness, may be increased merely by adopting a standing posture rather than a seated posture.

Study 1 aimed to measure the relationship between posture (seated vs. standing) and the feeling of closeness towards an observed individual. We adopted a naturalistic approach in accordance with Zaki and Ochsner's argument (2009, 2012) for the need to examine social cognition with ecological paradigms employing "more realistic stimuli involving social cues that are multimodal, dynamic and contextually embedded" (Zaki and Ochsner 2009, p. 7) to complement the dominant paradigms based on highly controlled laboratory studies. We hypothesized that people standing to watch a dance performance would report stronger feelings of closeness towards the dancer than people who had remained seated during the performance.

In this first experiment we established a social context in which the encounter is reduced to observation; without any verbal interaction between observer and performer that could influence the judgment; at a public distance (Hall 1966) where most nonverbal communication is through gestures and posture. The experiment was conducted in a collective situation both to create a context congruent with that typical of dance performance and for practical reasons - time constraints and the physical endurance of the performers. We gathered an audience in a theater and presented them with a series of 1 min dance sequences performed by professional dancers at a public distance. Posture was manipulated to ensure that half the audience observed the performances standing whilst the other half of the audience watched the performances remaining seated. A measure of closeness was taken in between the dance sequences. Measures of closeness available in the literature e.g. the Inclusion of Other in the Self scale (Aron et al. 1992) and the Relationship Closeness Inventory (Berscheid et al. 1989), are designed to assess closeness in the context of intimate or romantic relationships rather than closeness between extraneous individuals, so we developed a bespoke scale of closeness. Our scale of closeness included items assessing the feeling of closeness; the feeling of being in contact directly; involvement with the actions of the observed person and two items intended to measure the degree to which the performance modified an observer's perception of time and space. Participants rated how emotionally close they felt to the performer, how touched they were by the sequence, and how much they felt in contact with the performer.

Within the framework of our naturalistic approach we controlled for contextual variables known to influence individual perceptions and affects e.g. perception of facial expressions in others (Niedenthal et al. 2010). We controlled for visibility of performers' facial expressions using a within-group manipulation: for half the dance sequences the performer wore a mask; for the other sequences the performer danced unmasked. We predicted that feelings of closeness would be greater when the performers' facial expressions were visible than when they were hidden.

It has been shown that individual emotional processing may be influenced by external sound (Dillman-Carpentier and Potter 2007; Gomez and Danuser 2007; Husain et al. 2002). For example, Gomez and Danuser (2007) showed that musical

structural components such as rhythm and tempo influence emotions and individual arousal such that fast tempo is associated with positive affect and higher heart rate (HR). In the light of these findings, we manipulated contextual tempo by playing metronome during the dance sequences; a slow beat was played in half the sequences; a fast beat in the remainder, metronome speed was independent of the dance movements and no music was used. We predicted that observers would report increased feelings of closeness towards the performers when the background tempo was fast.

The second purpose of the present research was to examine the physiological factors that may contribute to the effects of a standing posture. We hypothesized that physiological differences between standing and sitting provide a mechanism by which posture determines one's feeling of closeness towards others. It has been shown that HR is higher in a standing position than a seated or supine position (Grant et al. 2012; Taylor et al. 2013). It has also been established that HR plays significant role in social perception. White et al. (1981) examined the effects of arousal on romantic attraction of male participants towards a female confederate they saw on video and expected to meet. Arousal was manipulated by having participants run on the spot for either 15 s (low arousal) or 120 s (high arousal) and resulted in a significantly higher self-measured HR change in high arousal participants. The behavioral results showed that high arousal participants were more romantically attracted to the female confederate when than the low arousal participants.

Study 2 was conducted to (a) confirm the postural differences in HR and (b) assess the effects of the interaction between posture and tempo on HR in a controlled laboratory setting. HR would be measured accurately with an oximeter and the metronome beats providing the contextual tempo would be heard through headphones rather than through speakers in the performance space.

Study 1

Method

Sample

Recruitment for the study was made via an announcement of the study in the press. Participants were 102 females and 25 males aged 15 to 70 years (mean age=33.9; Md=27; SD=14.7). Thirty-seven percent of the participants reported dancing on a regular basis. Eighty-five percent of participants indicated that they did not know the dancers personally, and 82 % had never seen them perform previously. Eighty-nine percent of participants had previously attended dance performances (seldom=30 %; sometimes=44 %; often=15 %); while 11 % reported they had never previously attended a dance.

Design

The experiment consisted of a 2×2×2 mixed factorial design including Posture (standing vs. seated) as a between-subjects factor. The within-subjects factors were Mask - a manipulation of facial visibility (masked dancers vs. unmasked dancers) and Tempo (metronome at 64 beats per minute, bpm, vs.128 bpm).

Procedure and Materials

Participants were led into a theater and seated in an auditorium. On entering the auditorium participants were given a questionnaire and allocated a seat number which randomly assigned them to one of the two experimental conditions (standing or seated). Ten participants of the standing condition prevented seatmates in the sitting condition from having a clear view of the stage. Therefore, they were switched to the sitting condition and instructed to remain seated during the whole performance. As a consequence, group size was unequal between standing (N=53) and the sitting (N=74) conditions, but did not affect the homogeneity of variance assumption as regards to the feelings of social closeness (Levene's F=1.31; p<0.25). Participants were told that the aim of the study was to assess personal reactions and feelings when watching a dance performance and that their data would be anonymous. Before the first dance sequence participants responded to questions about their own dancing, personal relationship with the performers, attendance at previous performances by the dancers and general attendance at dance performances.

The combination of Mask, Tempo and the dancers' gender resulted in series of eight different sequences, which were presented twice each, giving a total of 16 sequences, with a 2 min break between each sequence. While the two dancers took turns performing to avoid physical fatigue, Mask and Tempo conditions were presented in a counterbalanced order. Posture was operationalized such that half the audience watched all the dance sequences standing up, whilst the other half were seated throughout. Participants in the standing condition stood in front of their seats and were at the same distance from each other as seated participants. Dance sequences lasted 1 min and were performed alternately by two professional dancers, one female and one male, (ex-members of the Maurice Béjart Ballet Company, Lausanne) with the sound of a metronome ticking relayed through loudspeakers. The dance sequences involved movements of the performers over different areas of the stage and included standing, sitting and lying poses to eliminate the possibility that a feeling of closeness toward the dancers may be due to mimicry (Chartrand and Bargh 1999). Two within-subjects factors were also included in the design: (a) in half the sequences the dancers wore a mask to hide facial expressions and (b) the background metronome beat was slow (64 bpm) for half the sequences and fast (128 bpm) for the remainder. Performance of the dance sequences was independent of the manipulated tempo i.e. the dancers performed exactly the same sequence, at the same pace regardless of background tempo.

After each sequence participants were seated to report their reactions to the performance on a seven-item questionnaire: (1) 'I was touched by this sequence', (2) 'The sequence seemed to last a very short/very long time', (3) 'I felt as if I were somewhere else', (4) 'I felt close to the dancer', (5) 'I felt in touch with the dancer', (6) 'I felt as if I was being swept away by the dancer' and (7) 'I wanted to dance or move about'. Participants rated their agreement with each statement by marking through a 65 mm long straight line scale labelled 'Not at all' at one end and 'Absolutely' at the other. For item 2 the labels were 'A very short time' and 'A very long time'. The last page of the questionnaire stated that there would be a basket for donations to the dancers at the exit and subjects were asked to write down the amount of money they were prepared to give. Responses to this indirect measure of mood (Carlson et al. 1988) allowed us to

control for differences in the participants' mood between the standing and the seated conditions.

At the end of the experiment participants were fully debriefed and thanked for their participation. The study was approved by the cantonal Ethics Committee for research on humans in Lausanne, Switzerland.

Dependent Variables

The dependent variables were operationalized as the distance (in mm) along the response line from the left extremity. After verification of internal consistency (all Cronbach $\alpha > 0.91$), the mean for each item was calculated across the 16 sequences. We then performed a principle components factor analysis with a Varimax rotation to define common dimensions to the seven dependent variables. This analysis revealed two main factors accounting for 79.9 % of the total variance. The first factor (63.4 % of the variance) was explained by items 4; 5; 6; 1 and 7 in descending order of factor loadings (0.959; 0.953; 0.946; 0.919 and 0.811 respectively). We therefore labelled this factor 'feeling of closeness with the dancers'. The second factor (16.4 % of the variance) was explained by items 2 and 3 (factor loadings 0.790 and 0.723 respectively) relating to participants' spatiotemporal perceptions during the dance sequences (duration of the sequences and sensation of being elsewhere). In view of the weakness of this second factor, items 2 and 3 were not taken into consideration in the analyses. A final score for 'feeling of closeness' was computed as the mean of the five items explaining the first factor (Cronbach $\alpha = 0.95$). Distributions of the computed feeling of closeness variable did not meet the criteria for symmetry (Skewness=0.604; SE=0.215), but after exclusion of outliers (scores more than two standard deviations from the mean; $N=4$), the asymmetry of the distribution was acceptable (Skewness=0.232; SE=0.218).

Results

Preliminary Analyses

Crosstabs analysis to check whether the participants were distributed homogeneously in the experimental conditions with respect to whether they danced themselves, knew the dancers personally, and had previously attended dance performances found no significant differences between the experimental conditions. Participants' feelings of closeness did not vary with the gender of the dancers.

We also checked for an effect of posture on mood by performing a one-way ANOVA with amount of intended donation as the dependent variable. The results showed no difference between the two experimental conditions ($F(1,121)=0.88$; $p < 0.40$). In addition, the amount of the intended donation was not related to the feeling of closeness ($r=0.025$).

A linear regression analysis was performed to check for the effect of distance from the performer on the feeling of closeness towards the performer, with seat row as the predictor variable and feeling of closeness towards as the criterion variable. The results showed that the distance from the stage did not predict feeling of closeness ($\beta=0$ .01; $p<0.70$).

Finally, we checked whether variation in feeling of closeness towards the dancers could depend on personal dance practice, on knowing the performers, or on the frequency

of attendance at dance performances. One-way ANOVAs with personal dance practice and personal relationship with the performers as dependent variables showed no significant effect of these two variables. A linear regression analysis was performed to examine the relationship between frequency of attendance at dance performances and feeling of closeness to the performers. The result showed a significant positive relationship between the frequency of attendance at dance performances and feeling of closeness (β=3.89; t(126)=3.23; p<0.01). This effect may be explained by an increased familiarity with the body language of dance through frequent attendance at performances. In addition, there is evidence that familiarity with an object or a person facilitates one's empathy towards it (for a review, see Preston and De Waal 2002).

Main Analyses

To test our hypotheses, we conducted a 2×2×2 mixed-factor analysis of covariance (ANCOVA) in which we introduced Posture as the between-subjects factor, Mask and Tempo as within-subjects factors and frequency of Attendance at dance performances as a covariate. The results showed a significant main effect of Posture (F(1,120)=5.07; p<0.03; η_p^2=0.04) confirming the hypothesis that participants in the standing condition feel psychologically closer to the dancers (M=25.90; SE=1.59; N=51) than those in the seated condition (M=21.20; SE=1.35; N=72), see Fig. 1. No interaction effects were observed between Posture and the two within-subjects factors.

No main effects for Mask or Tempo were observed, nor was there an interaction between Mask and Tempo. On the other hand, the results indicated a three way interaction between Attendance, Mask and Tempo (F(1,120)=6.24; p<0.02; η_p^2= 0.05). To explore this interaction (see Fig. 2), we dichotomized the Attendance factor (attends rarely vs. attends frequently). Contrast analyses of the interaction showed that all the differences between comparable means were significant (p<0.03), except for the effect of Tempo in Masked sequences for participants who rarely attended dance performances. The overall pattern of this interaction indicates that participants who attend dance performances more often, felt closer to the dancers when watching the dancers performing unmasked and with a fast (128 bpm) background tempo.

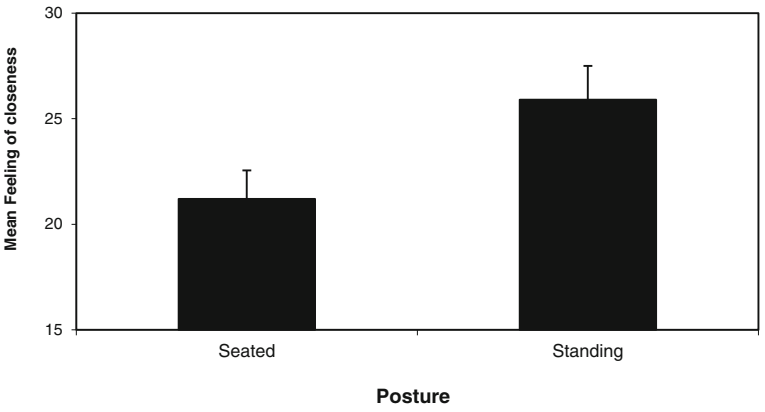

Fig. 1 Feeling of closeness (range: 0–65) according to the posture of the spectators

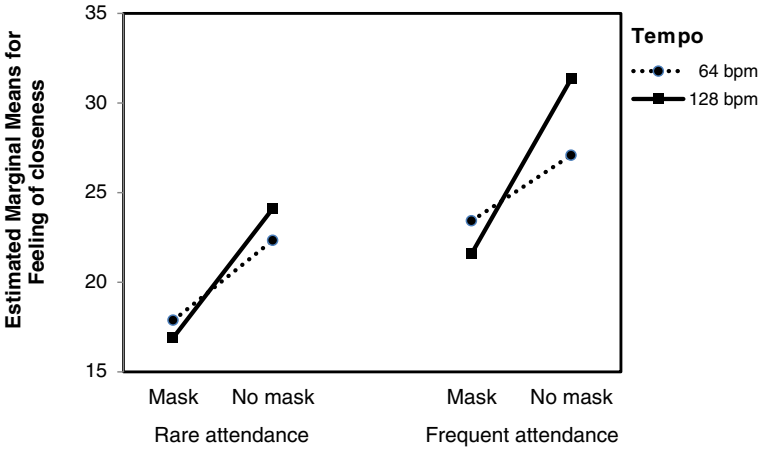

Fig. 2 Feeling of closeness (range: 0–65) as a function of facial visibility, background tempo and frequency of attendance at dance performances

Discussion Study 1

The results confirmed our hypothesis that a standing posture enhances feelings of social closeness relative to a seated posture. This finding illustrates the fact that, although no active physical movement is made to reduce the *physical* distance between the observer and the object of interest, adopting an upright standing pose induces a reduction of *social* distance. This effect occurs in spite of the physical distance between observers and the performers, and appears to be independent of contextual factors such as the visibility of the performer's facial expressions and the background aural tempo during the performance.

However contrary to our predictions, the analyses showed no independent impact of the visibility of performers' facial expressions or of background tempo on observers' feeling of closeness to the performers. The lack of effect of facial visibility may have been due to the fact that the mask worn by performers was subject to changes in inclination and lighting during the performance which produced a Noh mask effect (Lyon et al. 2000), whereby opposite emotions are conveyed according to whether the mask is tilted forward or backward. If the effect of changes in mask inclination under stage lighting is interpreted by observers as an expression of affect, this may have reduced the distinction between the masked and unmasked conditions. We had hypothesized that background tempo would influence perceived closeness to performers by extrapolation from studies in which tempo was manipulated as one dimension of musical excerpts (Gomez and Danuser 2007). Our findings suggest that tempo as an isolated variable rather than an inherent part of a musical excerpt is not sufficient to influence affect, specifically other-related feelings as in this study.

Frequency of attendance at dance performances appeared to mediate the effects of perfomer facial visibility and background tempo on observers' feeling of closeness towards the performers. Reported feeling of closeness was greatest amongst participants who reported attending dance performances frequently, when they observed the dancers perform unmasked and with a fast background tempo. One possible explanation for this result is that these more experienced observers of dance assimilated the experimental conditions to conditions familiar from attendance at other dance performances they habitually attend.

Study 2

In the light of the findings of Study 1, Study 2 was carried out to confirm postural differences in HR and to clarify the potential influence of tempo on HR. Although background tempo did not influence feeling of closeness in Study 1, we included the factor in the design for Study 2 to examine whether this aural factor has an independent or interactive effect on HR with posture. We predicted that there would be a main effect of posture on HR, but in line with the results of Study 1, there would be no main effect of tempo on HR.

Method

Sample and Design

Participants were 9 females and 11 males aged 18 to 60 years (mean age=28.5; Md=26; SD=11.5). The experiment consisted of a 2×2 within-subjects factorial design including Posture (standing vs. seated) and Tempo (metronome beat at 64 bpm vs. 128 bpm) as the within-subject factors and HR as the dependent variable. The order of the experimental conditions was randomized across participants.

Procedure and Dependent Variable

All participants gave informed consent before taking part in the study. Participants were welcomed to the laboratory and told that the task consisted of standing up or remaining seated at the request of the experimenter, and that they might or might not hear a metronome beating through their headphones. After the briefing, participants were seated on a chair with no table in front of it, wearing headphones and with a soft finger sensor attached to their left-hand index tip. The sensor was connected by cable to a pulse oximeter (Philips M3046A) that monitored heart rate. The experiment started with a 2 min rest in the seated posture to allow the participant's HR to reach a stable resting baseline. Following the stabilisation period, timing was similar to that used in Study 1. Participants remained in their assigned experimental position (standing or seated) for 1 min test sessions during which they heard either a 64 bpm or 128 bpm beat through the headphones. Each test session was followed by a 2 min break during which all participants were seated without hearing the metronome beat. Timing was controlled by an E-Prime script. During the one-minute test sessions participants' HR was recorded at 10 s intervals. The mean of these six HR values was used as the dependent variable for each session.

Results

With data from 20 participants, the distribution of the HR measure satisfied the assumption of normality (Skewness=0.33; SE=0.51). To test our hypotheses, we performed a repeated measures ANOVA including Posture and Tempo as the two within-subject factors and HR as the dependent variable. The results showed only a main effect of Posture such that HR was significantly higher when participants were standing (M=78.9; SE=2.09) compared to when they were seated (M=67.4; SE=1.72;

$F(1,19)=95.72$; $p<0.001$; $\eta_p^2=0.83$; see Fig. 3). No main effect of Tempo ($p<0.50$) and no interaction between Posture and Tempo ($p<0.70$) were observed.

Discussion Study 2

As predicted, and in line with previous findings (Grant et al. 2012), the standing position resulted in a higher HR than the seated position. Tempo did not appear to influence the posture-related variations in HR. This suggests that tempo does not influence HR when it is operationalized as an isolated dimension rather than being embedded in music (Gomez and Danuser 2007) or associated with a musical key (Khalfa et al. 2008).

General Conclusion

The present research provides new evidence on the relationship between body posture and social perception. Previous research has shown that social cognitions such as attitudes and preferences may be influenced by repeated head movements (Wells and Petty 1980) or tensed arm postures (Cacioppo et al. 1993). The principal aim of the present research was to explore whether other-related feelings such as the feeling of closeness may be influenced by minimal manipulations of posture such as standing vs. seated posture. The results of Study 1 confirmed this hypothesis: when observing a performer from a standing position, observers tend to report stronger feelings of closeness towards the performer than when observing from a seated position. We attribute this result to the fact that standing up in social situations embodies the anticipation of connecting to others. Standing up represents the preliminary stage in the process of reducing physical distance that separates us from something or someone. It has been shown that physical distance and psychological distance are related (Williams and Bargh 2008). By priming the individual with a standing posture, the individual embodies the expectancy of closing up with the observed target.

Our second aim was to confirm the hypothesis that the effect of a standing position on feelings of social closeness may be due to the increase in HR associated with

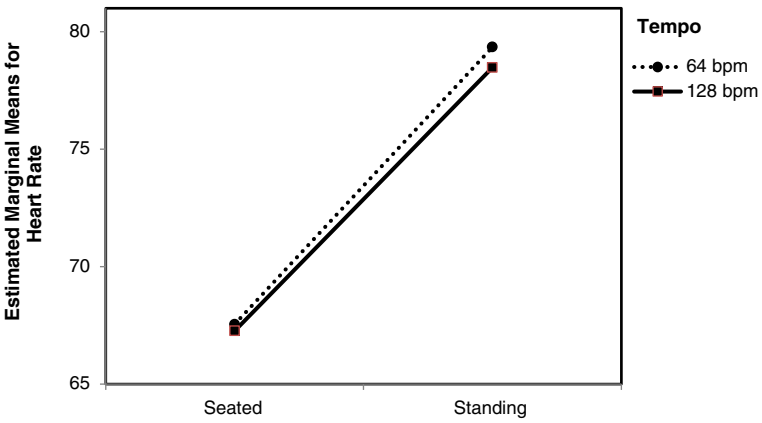

Fig. 3 Heart rate (mean pulses per minute) as a function of posture and tempo

assuming a standing position. We also wanted to explore further the possible effect of tempo. We had hypothesized an effect of tempo on social closeness based on research showing that interpersonal attraction may be induced by physiological arousal that includes a rise in HR (White et al. 1981). Study 2 found that in accordance with previous experimental findings (Grant et al. 2012; Taylor et al. 2013), HR is higher in a standing position than a seated position. The results of Study 2 diverge from previous findings, showing that tempo, when presented as a simple metronome beat rather than as part of a multidimensional music excerpt, appears to have no effect on HR.

The original aspect of our first study is that the main hypotheses were tested in a naturalistic setting, thus extending the investigation of social cognition beyond the laboratory to a contextualized social environment (Zaki and Ochsner 2009). Although there are indisputable advantages to testing psychological hypotheses about human behaviour in naturalistic settings, this approach has limitations. In the present Study 1, measurement of the hypothesized mediating variable, HR, was impractical as the experiment was carried out as a one-off session, involving the simultaneous participation of over a hundred people. As a consequence, although Study 2 confirmed an association between a standing position and higher HR, the role of HR as the mechanism by which posture influences the feeling of social closeness remains to be proved. A possible future experimental design would include HR and posture (standing vs. seated) as experimental factors and feeling of social closeness as the dependent variable. Inducing an increase in HR of approximately 12 pulses per minute in the sitting position - an increase similar to that produced by assuming a standing position – might increase feelings of social closeness to a level comparable to that found when observers are in the standing position.

In sum, our findings demonstrate a link between body posture and social connection providing evidence that standing up strengthens the feeling of closeness to others. These findings are consistent with those observed in previous research on the relation between embodiment and social cognition and are encouraging to researchers interested in examining such relation in naturalistic settings.

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Conflict-of-Interest Statement The authors declare that they have no conflict of interest.

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