1. Introduction

While early work on human attraction focused on identifying characteristics that people, on average, consider to be attractive, more recent research has focused on identifying factors that predict individual differences in attractiveness judgments and mate preferences (Little & Perrett, 2002). One particularly fruitful area of such research investigates the relationship between individual differences in sex-typical characteristics and variation in preferences for potential mates possessing exaggerated sex-typical physical characteristics (Jones et al., 2007; Penton-Voak et al., 2003; Smith et al., 2009; Vukovic et al., in press).

Women who possess exaggerated sex-typical (i.e., feminine) physical characteristics, such as low waist–hip ratio and high voice pitch, show stronger preferences for men with masculine facial and vocal cues than do women who possess relatively masculine physical characteristics (Penton-Voak et al., 2003; Smith et al., 2009; Vukovic et al., in press). Because studies have found that masculine characteristics in men (e.g., robust jaw) and feminine characteristics in women (e.g., large eyes) are correlated with indices of long-term health (Thornhill & Gangestad, 2006) and reproductive potential (Rhodes, Simmons, & Peters, 2005), such preferences may be adaptive if feminine women are better able to attract and/or retain masculine mates (Penton-Voak et al., 2003; Smith et al., 2009; Vukovic et al., in press). While these studies present compelling evidence that the extent to which women display exaggerated sex-typical physical characteristics predicts individual differences in the extent to which they prefer masculine men, it is not known whether the extent to which women display exaggerated sex-typical psychological traits also predicts individual differences in women’s preferences for masculine physical characteristics.

Many studies have shown that women tend to score significantly higher on empathizing scales, which assess the ability to interpret and respond appropriately to others’ emotions and thoughts, than men do and that men tend to score significantly higher on systemizing scales, which assess the ability to construct, predict and control lawful systems, than women do (see Wakabayashi et al., 2006, for a comprehensive review). In other words, empathizing is an example of a feminine psychological trait and systemizing is an example of a masculine psychological trait. If the extent to which women display exaggerated sex-typical psychological traits is positively correlated with the strength of their preferences for masculine men, as is the case for feminine physical characteristics in women (Penton-Voak et al., 2003; Smith et al., 2009; Vukovic et al., in press), individual differences in empathizing may predict variation in women’s preferences for masculine
2.1. Stimuli

Assessing men's and women's preferences for sexually dimorphic shape cues in both own- and opposite-sex faces allows us to investigate whether exaggerated sex-typical psychological characteristics predict attractiveness judgments of potential mates only or also predict attractiveness judgments of potential own-sex associates. Because measures of the viewer's own condition have previously been shown to predict perceptions of opposite-sex, but not own-sex, individuals (Jones et al., 2007; Little, Burt, Penton-Voak, & Perrett, 2001), we predicted that exaggerated sex-typical psychological characteristics would also predict judgments of opposite-sex faces only. Our study was conducted online.

2. Methods

2.1. Stimuli

Following many previous studies (e.g., DeBruine et al., 2006; Jones et al., 2007; Smith et al., 2009; Welling, Jones, & DeBruine, 2008a; Welling et al., 2007, 2008b), we used well-established computer graphic methods to objectively and systematically manipulate sexually dimorphic shape cues in digital images of men's and women's faces (see DeBruine et al., 1998; Tiddeman, Burt, & Perrett, 2001). Briefly, we manufactured masculinized and feminized versions of face images of 20 young White adult men and 20 young White adult women (Fig. 1) by either adding or subtracting 50% of the linear differences in 2D shape between symmetrized male and female prototypes (following, e.g., DeBruine et al., 2006; Jones et al., 2007; Smith et al., 2009; Welling et al., 2007, 2008a, 2008b).

Masculinized versions of face images created using these methods are perceived to be more masculine and dominant than feminized versions (e.g., DeBruine et al., 2006; Jones et al., 2010; Welling et al., 2007, 2008a, 2008b), demonstrating that these methods for varying sexually dimorphic shape cues reliably influence perceptions of masculinity–femininity in the expected manner. Preferences for exaggerated sex-typical facial characteristics assessed using face stimuli manufactured using our methods are consistent with preferences assessed using alternative methods for manipulating masculinity–femininity (see DeBruine, Jones, Smith, & Little, in press; DeBruine et al., 2006).

2.2. Questionnaires

Following previous studies (e.g., Penton-Voak, Allen, Morrison, Gräweiski, & Campbell, 2007; von Horn, Bäckman, Davidsson, & Hansen, 2010), individual differences in systemizing and empathizing were assessed using the short-forms of the systemizing (25 items) and empathizing (22 items) scales developed by Wakabayashi et al. (2006). Scores can range from 0 to 50 for the systemizing scale and 0 to 44 for the empathizing scale. Further information on the psychometric properties of these scales is given in Wakabayashi et al. (2006).

2.3. Procedure

Heterosexual men (N = 130, mean age = 25.31, SD = 7.40) and women (N = 125, mean age = 24.81, SD = 7.35) completed a short face preference test in which they were shown the 20 pairs of men's faces and 20 pairs of women's faces (each pair consisting of a masculinized and feminized version of the same individual) and were asked to “Please indicate which face you think is more attractive”. Male and female face pairs were randomized within a single block of trials and the side of the screen on which any individual was shown was fully randomized. This method for assessing preferences for masculinized versus feminized versions of face images has been used in many previous studies (e.g., DeBruine et al., 2006; Jones et al., 2007; Smith et al., 2009; Welling et al., 2007, 2008a, 2008b).

In addition to completing the face preference test, each participant also completed the short-form empathizing and systemizing scales (Wakabayashi et al., 2006). The order in which participants completed the face preference test, empathizing scale, and systemizing scale was fully randomized.

The study was conducted online with participants recruited via links from social media websites. Previous research has demonstrated that online and lab-based studies of individual differences in preferences for exaggerated sex-typical facial characteristics show very similar patterns of results (e.g., Jones et al., 2007; Welling et al., 2008a). Data from duplicate internet protocol (IP) addresses were not recorded to reduce the possibility of duplicate participants.

3. Results

3.1. Sex-differences in empathy and systemizing

Responses on the empathizing and systemizing scales were scored following Wakabayashi et al. (2006). As predicted, men scored higher on the systemizing scale than women did (t(253) = 7.51, p < 0.001) and women scored higher on the empathizing scale than men did (t(253) = 3.76, p < 0.001). Men’s mean score on the systemizing scale was 26.99 (SD = 9.12) and women's mean score was 18.31 (SD = 9.34). Women's mean score on the empathizing scale was 25.75 (SD = 8.54) and men's mean score was 21.71 (SD = 8.65). These scores are similar to those observed in previous research using the same versions of these scales (e.g., Wakabayashi et al., 2006).

3.2. Female participants

For each female participant, we calculated the proportion of trials on which she chose the feminized male face as the more attractive. Corresponding values were also calculated for judgments of women's faces. Note that, following previous research (e.g., Jones et al., 2007; Welling et al., 2008b), for both male and female faces, high scores indicate strong preferences for femininity. One-sample t-tests comparing these values with what would be expected by chance alone (i.e. 0.5) showed that women chose the feminized versions of both male (t(124) = 2.34, p = 0.021; M = 0.55, SEM = 0.02) and female (t(124) = 22.97, p < 0.001; M = 0.81, SEM = 0.01) faces significantly more often than the masculinized versions.

Next, we investigated the relationship between women's scores on the empathizing and systemizing scales and their responses on the face preference tests using ANCOVA [dependent variable: pro-
portion of feminized faces chosen; within-subjects factor: sex of face (male, female); covariates: empathizing score, systemizing score]. This analysis revealed a significant interaction between sex of face and empathizing score \((F(1.122) = 8.32, p = 0.005)\) and no other significant effects (all \(F < 1.20, all \ p > 0.29\)).

We conducted correlation analyses to interpret the significant interaction between sex of face and empathizing score. Women's empathizing scores were negatively correlated with the proportion of trials on which they chose feminized faces when judging men's attractiveness \((r = -0.19, N = 125, p = 0.035)\), but not women's attractiveness \((r = 0.11, N = 125, p = 0.24)\). Corresponding partial correlations controlling for possible effects of participant age did not alter this pattern of significant results.

3.3. Male participants

Men's responses were analyzed in the same way as women's responses. For each male participant, we calculated the proportion of trials on which he chose the feminized male face as the more attractive. Corresponding values were also calculated for judgments of women's faces. One-sample \(t\)-tests showed that men chose the feminized versions of both male \((t(129) = 3.72, p < 0.001; M = 0.58, SEM = 0.02)\) and female \((t(129) = 16.14, p < 0.001; M = 0.76, SEM = 0.02)\) faces significantly more often than the masculinized versions.

ANOVA \([dependent variable: proportion of feminized faces chosen; within-subjects factor: sex of face (male, female); covariates: empathizing score, systemizing score]\) revealed a significant interaction between sex of face and systemizing score \((F(1.127) = 4.84, p = 0.030)\) and no other significant effects (all \(F < 1.20, all \ p > 0.29\)). Men's systemizing scores were positively correlated with the proportion of trials on which they chose feminized faces when judging women's attractiveness \((r = 0.19, N = 130, p = 0.027)\), but not men's attractiveness \((r = -0.04, N = 130, p = 0.64)\). Corresponding partial correlations controlling for possible effects of participant age did not alter this pattern of significant results.

3.4. Additional analysis

We conducted a final ANCOVA in which men's and women's responses were entered into a single analysis \([dependent variable: proportion of feminized faces chosen; within-subjects factor: sex of face (male and female); between-subjects factor: participant sex (male and female); covariates: empathizing score, systemizing score]\). This analysis revealed the expected three-way interactions among sex of face, participant sex and empathizing score \((F(2,250) = 6.60, p = 0.002)\) and among sex of face, participant sex and systemizing score \((F(2,250) = 3.99, p = 0.020)\).

4. Discussion

Consistent with many previous studies (see DeBruine et al., 2006, in press, for reviews), both men and women judged feminized versions of male and female faces to be more attractive than masculinized versions. As we had predicted, women's empathizing scores were positively correlated with the strength of their preferences for masculine men, but did not predict responses to female faces. Similarly, men's systemizing scores were positively correlated with the strength of their preferences for feminine women, but did not predict responses to male faces. Systemizing scores in women and empathizing scores in men did not predict responses to either male or female faces. In other words, exaggerated sex-typical psychology predicted both women's and men's preferences for exaggerated sex-typical characteristics in opposite-sex, but not own-sex, faces.

Our findings complement previous research reporting associations between exaggerated sex-typical physical characteristics and preferences for exaggerated sex-typical characteristics in faces and voices (Penton-Voak et al., 2003; Smith et al., 2009; Vukovic et al., in press), suggesting that sex-typical physical and psychological traits have very similar effects on attractiveness judgments. Moreover, these similar effects of exaggerated sex-typical physical and psychological traits on attractiveness judgments are consistent with other research showing that sex-typicality in physical and psychological traits are correlated across individuals (e.g., Nettle, Tipper, 2007; von Horn et al., 2010). These latter findings raise the question of whether psychological traits mediate the relationship between physical traits and preferences, whether physical traits mediate the relationship between psychological traits and preferences, or whether psychological and physical traits are independently related to preferences. We suggest that investigation of these different causal pathways is an important topic for future research.

Empathizing and systemizing have been implicated in individual differences in fundamental aspects of face perception, such as identity recognition (Bate, Parris, Haslam, & Kay, 2010), sex classification (Penton-Voak et al., 2007) and gaze perception (Bayliss & Tipper, 2005). Our findings extend this work to implicate empathizing and systemizing in individual differences in judgments of facial attractiveness and, potentially, mate preferences.
References


