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Original Article

# Correlated Male Preferences for Femininity in Female Faces and Voices

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**Abstract:** Sexually dimorphic physical traits are important for mate choice and mate preference in many species, including humans. Several previous studies have observed that women's preferences for physical cues of male masculinity in different domains (e.g., visual and vocal) are correlated. These correlations demonstrate systematic, rather than arbitrary, variation in women's preferences for masculine men and are consistent with the proposal that sexually dimorphic cues in different domains reflect a common underlying aspect of male quality. Here we present evidence for a similar correlation between men's preferences for different cues of femininity in women; although men generally preferred feminized to masculinized versions of both women's faces and voices, the strength of men's preferences for feminized versions of female faces was positively and significantly correlated with the strength of their preferences for feminized versions of women's voices. In a second study, this correlation occurred when men judged women's attractiveness as long-term, but not short-term, mates, which is consistent with previous research. Collectively, these findings (1) present novel evidence for systematic variation in men's preferences for feminine women, (2) present converging evidence for concordant preferences for sexually dimorphic traits in different domains, and (3) complement findings of correlations between women's facial and vocal femininity.

**Keywords:** sexual dimorphism; mate preference; sexual selection; voice attractiveness; face attractiveness

## Introduction

Among men, masculine physical characteristics are correlated with indices of long-term health (Rhodes, Chan, Zebrowitz and Simmons, 2003; Thornhill and Gangestad, 2006), physical strength (Fink, Neave and Seydel, 2007), reproductive potential (Hughes, Dispenza and Gallup, 2004; Puts, 2005; Rhodes, Simmons and Peter, 2005), and, in natural fertility populations, reproductive success (Apicella, Feinberg and Marlowe, 2007). Although masculine physical traits in men are positively correlated with these indices of mate quality, masculine physical traits are also associated with some negative qualities. For example, men possessing masculine physical characteristics are interested in pursuing short-term, rather than long-term, relationships to a greater extent than their feminine peers (Boothroyd, Jones, Burt, DeBruine and Perrett, 2008; Rhodes et al., 2005). Masculine men are also ascribed more negative personality characteristics, such as dishonesty, and are more likely to be perceived as "bad parents" and willing to be unfaithful to their partners than feminine men are (Boothroyd, Jones, Burt and Perrett, 2007; Perrett et al., 1998). Thus, while masculine men possess many characteristics that are desirable in a mate (e.g., good health), they also possess characteristics that are undesirable in a long-term partner (e.g., low commitment, see Fink and Penton-Voak, 2002; Gangestad and Simpson, 2000; Jones et al., 2008a; Little, Jones, Penton-Voak, Burt and Perrett, 2002 for reviews). Since the manner in which women resolve this trade-off between the potential costs and benefits of choosing a masculine mate will differ among women, many researchers have emphasized that individual differences in women's masculinity preferences are to be expected (Fink and Penton-Voak, 2002; Gangestad and Simpson, 2000; Jones et al., 2008a; Little et al., 2002 for reviews).

Recent studies have reported that the strength of women's preferences for masculine male face shape is positively correlated with the strength of their preferences for masculine characteristics in men's voices (Feinberg, DeBruine, Jones and Little, 2008a) and also with the strength of their preferences for putative male pheromones (Cornwell et al., 2004). These correlations demonstrate that women vary systematically in their masculinity preferences and suggest that different cues of male masculinity may signal a common underlying quality (Cornwell et al., 2004; Feinberg et al., 2008a; Feinberg, 2008). Furthermore, these findings are consistent with those of studies demonstrating that factors that are known to influence women's preferences for masculinity (e.g., menstrual cycle phase, for reviews see Jones et al., 2008a and Thornhill and Gangestad, 2008) affect women's preferences for different markers of men's masculinity in the same way. For example, women show stronger preferences for masculinity during the fertile phase of the menstrual cycle than at other times when judging the attractiveness of men's faces (Jones et al., 2005; Penton-Voak et al., 1999; Welling et al., 2007), voices (Feinberg et al., 2006a; Puts, 2005), body shapes (Little, Jones and Burriss, 2007), and behavioral displays (Gangestad, Simpson, Cousins, Garver-Apgar and Christensen, 2004). Women also show stronger preferences for androstenol, a putative male pheromone, around ovulation than at other times (Grammer, 1993).

While there is compelling evidence that systematic variation in women's masculinity preferences occurs for physical cues of male masculinity in different domains, there is very little evidence for similar variation in men's preferences for sexually

dimorphic physical traits in women. Although some recent studies have observed positive correlations between men's testosterone levels and their preferences for feminine women (Welling et al., 2008) and between sensation seeking, a trait that is associated with both testosterone levels and facial masculinity in men (Campbell et al., 2010), and men's preferences for feminine women (Jones et al., 2007), these studies have focused exclusively on men's face preferences. Stronger preferences for feminine women among masculine men or men with high testosterone levels may be adaptive if such men are better able to attract feminine mates (Jones et al., 2007). Consistent with this proposal, previous studies have shown that feminine women demonstrate stronger preferences for masculine men than do relatively masculine women (e.g., Penton-Voak et al., 2003; Smith et al., 2009; Vukovic et al., 2010).

Although men's preferences for feminine characteristics in women's faces and their preferences for putative female pheromones are positively correlated (Cornwell et al., 2004), there is little other evidence that men's preferences for cues of femininity in women are correlated across different domains (e.g., face and voice). Men typically demonstrate strong preferences for feminine characteristics in women's faces (Jones et al., 2007; Perrett et al., 1998; Welling et al., 2008) and voices (Collins and Missing, 2003; Feinberg, DeBruine, Jones and Perrett, 2008b; Jones, Feinberg, DeBruine, Little and Vukovic, 2008b; Jones, Feinberg, DeBruine, Little and Vukovic, 2010a). There is also evidence that feminine physical characteristics in women's faces and voices may signal a common underlying quality, such as estrogen level. For example, women's voice pitch and perceived facial femininity are both positively correlated with their average estrogen level (Abitbol, Abitbol and Abitbol, 1999; Feinberg et al., 2006b; Law Smith et al., 2006). Moreover, women's facial femininity, assessed using a facial-metric method, and their voice pitch are also positively correlated (Feinberg et al., 2005a). Thus, if men vary systematically in the strength of their preferences for cues of women's estrogen levels, one might expect correlated male preferences for feminine characteristics in women's faces and voices. Evidence for such correlated preferences would (1) extend previous research on concordant female preferences for sexually dimorphic cues in different domains (Cornwell et al., 2004; Feinberg et al., 2008a) to variation in men's judgments of women's attractiveness, (2) complement previous findings for correlated male preferences for femininity in women's faces and putative female pheromones (Cornwell et al., 2004), and (3) be consistent with the proposal that feminine characteristics in women's faces and voices are cues to a common underlying quality (Feinberg et al., 2005a).

In light of the above, we examined the relationship between the strength of men's preferences for feminine pitch (i.e., raised fundamental frequency) in women's voices and the strength of men's preferences for feminine shape characteristics in women's faces. Following demonstrations that women's preferences for masculinity in male faces and voices are positively correlated (Feinberg et al., 2008a), we predicted a positive correlation between men's preferences for femininity in women's faces and voices. Although the main focus of our study was to test for correlated male preferences for feminine characteristics in women's faces and voices, rather than to identify possible sources of individual differences in men's femininity preferences, we did investigate the possible effects of men's self-rated attractiveness, a factor that is known to predict women's preferences for masculinity in men's faces (Little, Burt, Penton-Voak and Perrett, 2001; Little and Mannion, 2006) and voices (Vukovic et al., 2008). Given that men's preferences for feminine women are less

variable than women's preferences for masculine men (see Rhodes, 2006 for a meta-analytic review), we did not necessarily expect that the correlation between men's preferences for femininity in women's faces and voices would be as strong as that between women's preferences for masculinity in men's faces and voices (Feinberg et al., 2008a).

Cornwell et al. (2004) previously found that men's preferences for femininity in women's faces and their preferences for a putative female pheromone were positively correlated when participants judged women's attractiveness as long-term, but not short-term, mates. Consequently, in a second study, we tested whether a similar pattern of results was also evident in men's preferences for feminine characteristics in women's faces and voices.

## Study 1

The main aim of study 1 was to investigate the relationship between men's preferences for feminine characteristics in women's faces and voices.

### Materials and Methods

#### *Materials*

*Face stimuli.* Following previous studies of attractiveness judgments of feminine and masculine faces (DeBruine et al., 2006; Jones et al., 2007, 2010b; Welling et al., 2007; 2008), we used prototype-based image transformations to objectively and systematically manipulate sexual dimorphism of 2D shape in digital face images. Although different methods for manipulating masculinity of face images have been used in some other studies (e.g., Johnston, Hagel, Franklin, Fink and Grammer, 2001), these methods have been shown to produce effects on attractiveness judgments that are equivalent to those produced using the methods employed in our current study (DeBruine et al., 2006; DeBruine, Jones, Smith, and Little, 2010).

First, male and female prototype (i.e., average) faces were manufactured using established computer graphic methods that have been widely used in studies of face perception (e.g., DeBruine et al., 2006; Jones et al., 2007, 2010b; Welling et al., 2007; 2008). Prototypes are composite images that are constructed by averaging the shape, color and texture of a group of faces, such as male or female faces. These prototypes can then be used to transform images by calculating the vector differences in position between corresponding points on two prototype images and changing the position of the corresponding points on a third image by a given percentage of these vectors (see Rowland and Perrett, 1995; Tiddeman, Burt and Perrett, 2001 for technical details).

Here, 50% of the linear differences in 2D shape between symmetrized versions of the male and female prototypes were added to or subtracted from face images of twenty young White female adults (age: $M$ = 18.4 years, $SD$ = 0.7 years). This process creates masculinized and feminized versions of the individual face images that differ in sexual dimorphism of 2D shape and that are matched in other regards (e.g., identity, skin color and texture, Rowland and Perrett, 1995). Examples of masculinized and feminized face images are shown in Figure 1. Thus, twenty pairs of images were produced in total (each pair consisting of a masculinized and a feminized version of the same individual). Previous

studies using these stimuli have demonstrated that the masculinized versions are perceived as more masculine than the feminized versions (e.g., Welling et al., 2007, 2008), confirming that manipulating masculinity using these methods affects perceptions of masculinity in the intended manner. The face stimuli used in the current research have been used in several previous studies (e.g., Jones et al., 2007; Welling et al., 2007, 2008).

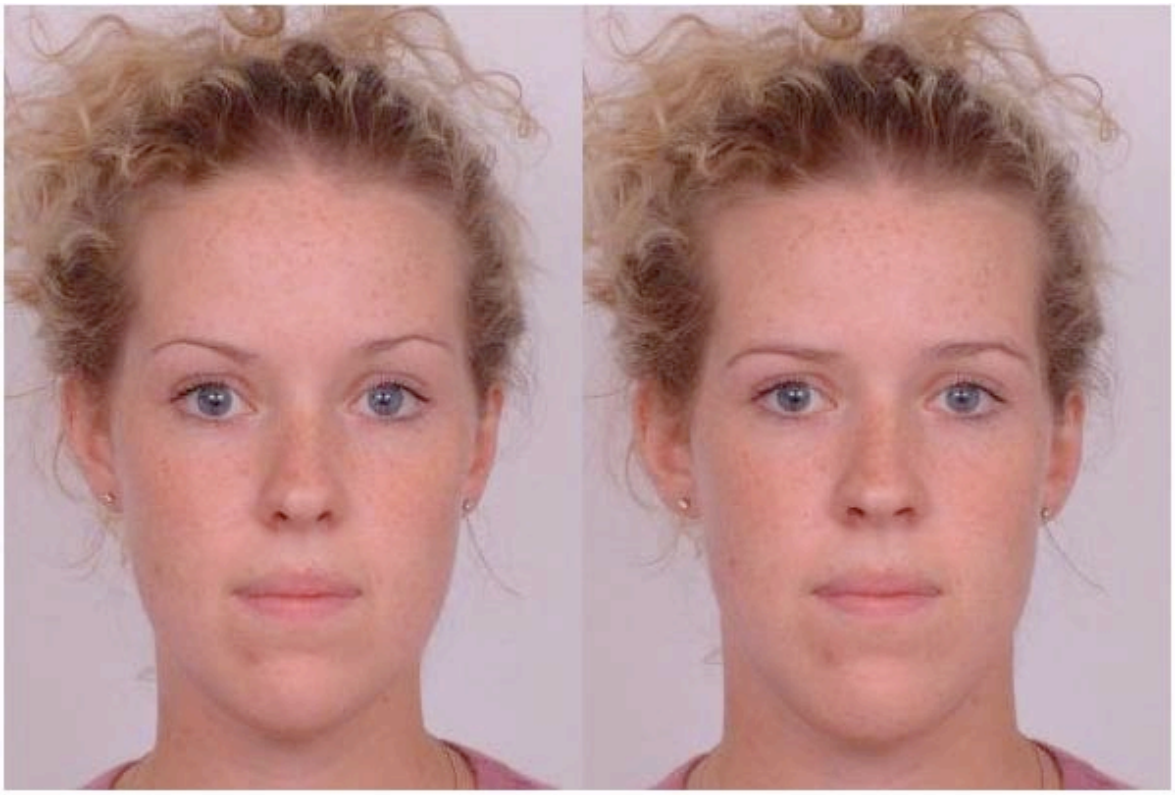

**Figure 1.** Examples of feminized (left) and masculinized (right) versions of a female face.

*Voice stimuli.* First, recordings of six women (mean age = 18.93 years, *SD* = 1.00 years) speaking the vowel sounds "eh" as in bet, "ee" as in see, "ah" as in father, "oh" as in note, and "oo" as in boot were randomly selected from a sample of recordings of 158 individuals' speech. All individuals recorded were young white adult undergraduate students at the University of St Andrews. Recordings were made using an Audio-Technica AT4041 microphone in a quiet room using Soundforge recording software, in mono, and at a sampling rate of 44.1 kHz with 16-bit amplitude quantization. The number of voices used in our study is similar to those used in previous studies that assessed preferences for masculinized and feminized voices (e.g., Jones et al., 2008b, 2010a; Feinberg et al., 2008a; Vukovic et al., 2008). Next, we manufactured two versions of each voice recording: a version with raised voice pitch (i.e., a feminized version) and a version with lowered voice pitch (i.e., a masculinized version).

Masculinized and feminized versions of voices were manufactured by raising and lowering pitch using the pitch-synchronous overlap add (PSOLA) algorithm in Praat (Boersma and Weenink, 2007) to +/- 0.5 ERBs (equivalent rectangular bandwidths) of the original frequency. This PSOLA method has been used successfully in other human voice attractiveness studies (Feinberg et al., 2006b, 2008a, 2008b; Jones et al., 2008b, 2010b;

Puts, Gaulin and Verdolini, 2006; Vukovic et al., 2008) and in studies of voice quality, dominance, and mate preferences among other mammalian species (Ghazanfar et al., 2007; Reby et al., 2005). While the PSOLA method alters voice pitch, other aspects of the voice are perceptually unaffected (Feinberg et al., 2005b, 2008a, 2008b). The manipulation performed here is roughly equivalent to +/- 20Hz in this particular sample, but takes into account the fact that pitch perception is on a log-linear scale in comparison to the natural frequencies (i.e., Hz, Traunmuller, 1990). The ERB scale was used here because of its better resolution at human average speaking frequencies than the tonotopic Bark, semitone, or Mel scales (Traunmuller, 1990). A manipulation roughly equivalent to 20Hz was used because it has been shown to be sufficient to alter men's attractiveness ratings of women's voices and women's attractiveness ratings of men's voices in prior studies (Feinberg et al., 2005b, 2006b, 2008a, 2008b; Jones et al., 2008b; Vukovic et al., 2008). After manipulation, amplitudes were scaled to a constant presentation volume using the RMS (root-mean-squared) method.

This process created six pairs of women's voices in total (each pair consisting of raised-pitch and lowered-pitch versions of the same recording). Mean fundamental frequency for the raised pitch versions was 251.7 Hz (*SD* = 18.5 Hz). Mean fundamental frequency for the lowered pitch versions was 208.1 Hz (*SD* = 16.7 Hz). These voice stimuli have been used in some previous studies of men's judgments of women's vocal attractiveness (e.g., Jones et al., 2010b). The mean pitch for the lowered pitch versions of the voices was lower and the mean pitch for the raised pitch versions was higher than the mean speaking voice pitch reported for women in other studies (e.g., ~220Hz, Childers and Wu, 1991).

*Procedure*

Each participant (*N* = 178, all men; mean age = 27.61 years, *SD* = 9.81 years) completed a face preference test and a voice preference test. In the face preference test, participants were shown the twenty pairs of faces (each pair consisting of a masculinized and feminized version of the same individual) and were asked to indicate which face was more attractive. The order in which the face pairs were shown and the side of the screen on which any given image was presented were fully randomized.

In the voice preference test, each participant was played the six pairs of voices (each pair consisting of a masculinized and feminized version of the same individual) and was asked to indicate which voice was more attractive. The order in which the voice pairs were played and the order in which the masculinized and feminized versions in each pair were played were both fully randomized.

Participants also rated their own attractiveness on a 1 (very unattractive) to 7 (very attractive) scale, following previous studies (Jones et al., 2007; Little et al., 2001; Vukovic et al., 2008). The order in which participants completed the face preference test, voice preference test and rated their own attractiveness was fully randomized.

The study was conducted online. Although some research has suggested there may be subtle differences between attractiveness ratings made in online tests and lab-based paper and pencil tests (Epstein et al., 2001), previous research into men's preferences for feminine characteristics in women's faces (e.g., Jones et al., 2007) and voices (e.g., Feinberg et al., 2008b; Jones et al., 2010a) using equivalent computer-based methods suggests that online and laboratory-based studies produce very similar patterns of results.

Participants were recruited by following links in online lists of web-based experiments (e.g., psychology.org).

*Initial processing of data.* For each participant, we calculated the proportion of trials in the face preference test on which he chose the feminized face as the more attractive. For each participant, we also calculated the proportion of trials in the voice preference test on which he chose the feminized voice as the more attractive.

## Results

Because some of our variables were not normally distributed, we used non-parametric tests for our main analyses.

First, we used Wilcoxon signed rank tests to compare the proportion of trials on which the feminized stimuli were chosen as the more attractive with what would be expected by chance alone (i.e., 0.5). For judgments of women's voices, men chose the feminized versions significantly more often than chance ($Z$ = 7.98, $p$<.001; $M$ = 0.68, $SEM$ = 0.02). For judgments of women's faces, men also chose the feminized versions significantly more often than chance ($Z$ = 11.06, $p$<.001; $M$ = 0.81, $SEM$ = 0.01). These findings show that the men in our study generally preferred feminized to masculinized versions of women's faces and voices.

Next, we tested for a significant correlation between men's preferences for femininity when judging the attractiveness of women's faces and voices. As we had predicted, men's preferences for femininity in women's faces and voices were positively and significantly correlated ($r_s$ = .15, $N$ = 178, $p$ = .042, Figure 2).

There was no significant correlation between participants' self-rated attractiveness and their preferences for femininity in women's faces ($r_s$ = .04, $N$ = 178, $p$ = .61) or voices ($r_s$ = -.12, N = 178, p = .12). Participant age was negatively correlated with men's preferences for femininity in women's voices ($r_s$ = -.19, $N$ = 178, $p$ = .010), but not faces ($r_s$ = -.09, $N$ = 178, $p$ = .23). To investigate whether age-related variation in femininity preferences contributed to the relationship between men's preferences for femininity in women's faces and voices, we used a regression analysis. Since men's preference for femininity in women's voices was normally distributed, these scores were entered as the dependent variable and men's age and preference for femininity in women's faces were included as independent variables. Note that regression analyses of this type assume that the dependent variable is normally distributed but do not assume that the independent variable is normally distributed (Hays, 1965). This analysis revealed a significant positive association between men's preferences for femininity in women's faces and voices ($t$ = 2.52, standardized beta = 0.18, $p$ = .013) and a negative association between men's preferences for femininity in women's voices and their age ($t$ = -2.84, standardized beta = -0.21, $p$ = .005).

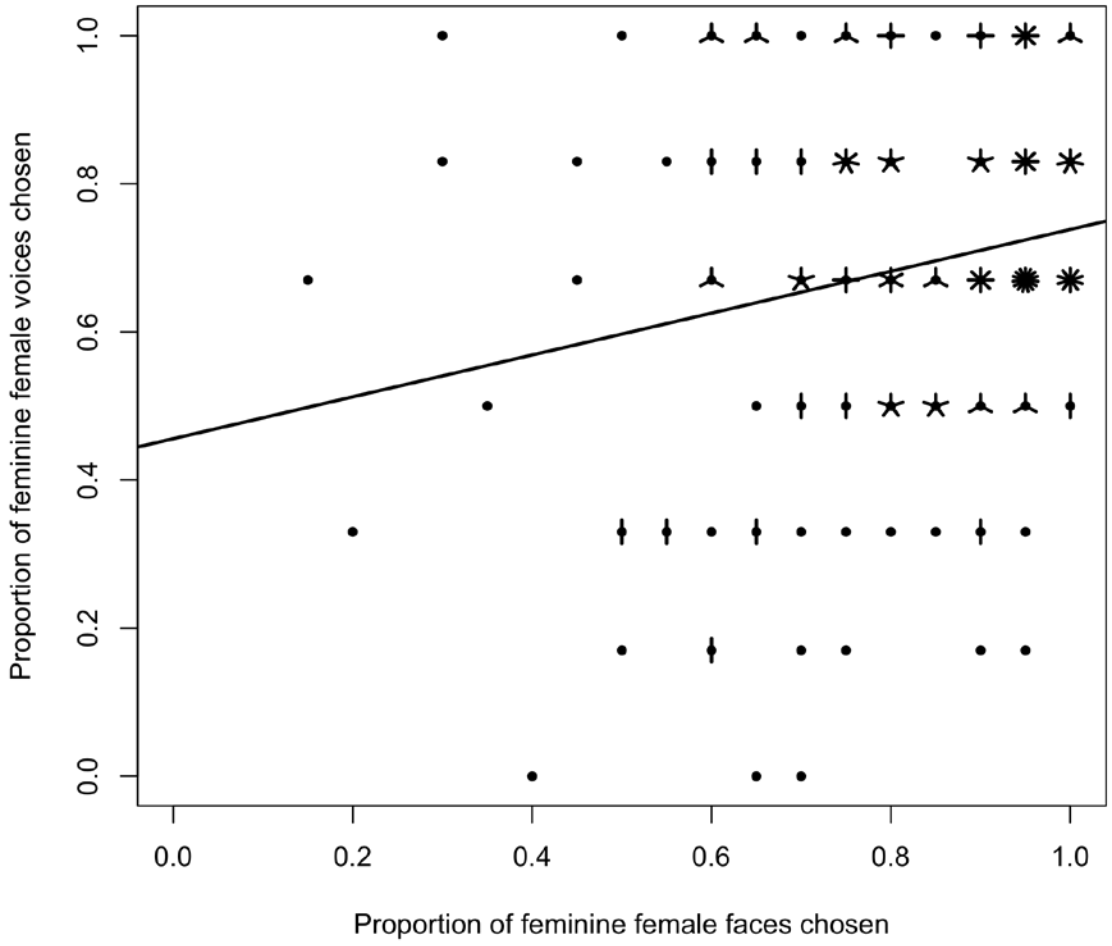


**Figure 2.** The positive correlation between men's preferences for feminized versions of women's faces and voices. Single data points are represented by dots and overlapping data points are each represented by a line radiating from the centre point.

## Study 2

In Study 1, we found that men's preferences for feminine characteristics in women's faces and voices were positively correlated. Cornwell et al. (2004) previously found that men's preferences for femininity in women's faces and their preferences for putative female pheromones were positively correlated when men judged women's attractiveness as long-term, but not short-term, mates. Consequently, in Study 2 we investigated whether the correlated preferences for feminine physical characteristics observed in Study 1 also occur when men judge women's attractiveness as long-term, but not short-term, mates.

### Materials and Methods

The methods and stimuli used in Study 2 were identical to those used in Study 1, except that men judged the attractiveness of the female stimuli twice (once for a short-term relationship and once for a long-term relationship) and all participants were male undergraduate students at the University of Aberdeen ($N$ = 35, Mean age = 19.83 years, $SD$ = 1.99 years). By contrast with Study 1, Study 2 was carried out in the laboratory. Short- and long-term relationships were defined using descriptions from previous research (e.g., Cornwell et al., 2004). The order of the four blocks of preference tests (judging voice attractiveness for a long-term relationship, judging face attractiveness for a long-term relationship, judging voice attractiveness for a short-term relationship, and judging face attractiveness for a short-term relationship) was fully randomized.

**Results**

As in Study 1, results from non-parametric tests are reported for all analyses. Wilcoxon signed ranks tests showed that men preferred feminized versions of faces and voices to masculinized versions for both short- and long-term relationships (see Table 1). Men's preferences for feminine women were stronger for long-term than short-term relationships when judging women's vocal attractiveness ($Z$ = 2.12, $p$ = .034), but not when judging women's facial attractiveness ($Z$ = 0.26, $p$ = .79).

**Table 1.** Men's preferences for feminized versions of voices and faces in Study 2.

| Condition | *Z* | *p* | mean | *SEM* |
|---|---|---|---|---|
| Voices, Short-term | 4.70 | <.001 | .77 | .03 |
| Voices, Long-term | 2.73 | .006 | .62 | .04 |
| Faces, Short-term | 5.13 | <.001 | .86 | .02 |
| Faces, Long-term | 5.18 | <.001 | .87 | .02 |

Men's preferences for feminized versions of women's voices and faces were positively correlated when judging women's attractiveness as long-term mates ($r_s$ = .34, $p$ = .043), but not as short-term mates ($r_s$ = .001, $p$ = .996). Age was weakly, but not significantly, related to men's preferences for feminine faces as long-term mates ($r_s$ = .29, $p$ = .093). No other relationships among the preference data and either age or self-rated attractiveness approached significance (all absolute $r_s$ <.25, all $p$>.15).

**Discussion**

Consistent with many previous studies (Feinberg et al., 2008b; Jones et al., 2007, 2008b, 2010a; Perrett et al., 1998), men preferred feminized versions of women's faces and voices to masculinized versions (Studies 1 and 2). Although men generally demonstrated strong preferences for feminized versions of women's faces and voices, we also found evidence for systematic variation in men's femininity preferences in both studies. As we had predicted, the strength of men's preferences for feminized female voices was positively correlated with the strength of their preferences for feminized female faces when men judged women's general attractiveness (Study 1) and when men judged women's

attractiveness as long-term, but not short-term, mates (Study 2).

That men's preferences for feminized female faces and voices were positively correlated complements previous research in which women's preferences for masculine characteristics in men's faces and voices were positively correlated (Feinberg et al., 2008a), and in which women's preferences for masculine characteristics in men's faces and putative male pheromones were also positively correlated (Cornwell et al., 2004). Thus, our findings for correlated male preferences for feminine characteristics in different domains demonstrate that correlated preferences for different sexually dimorphic traits are not limited to women's judgments of men's attractiveness, but can also occur for men's judgments of women's attractiveness (see also Cornwell et al., 2004). Feminine characteristics in women's faces and voices are, themselves, positively correlated (Feinberg et al., 2005a) and are positively correlated with women's average estrogen levels (Abitbol et al., 1999; Feinberg et al., 2006a; Law Smith et al., 2006). Such findings have led many researchers to suggest that feminine characteristics in women's faces and voices may signal a common underlying quality (see, e.g., Feinberg et al., 2005a and Feinberg, 2008). Our findings for correlated male preferences for femininity in women's faces and voices are consistent with this proposal and suggest that men respond to feminine cues in these two domains in similar ways. Indeed, using multiple cues in this way may increase the reliability of mate choice decisions (Candolin, 2003; Cornwell et al., 2004; Feinberg et al., 2008a). Consistent with Cornwell et al. (2004), we found that men's preferences for feminine characteristics in different domains were positively correlated when men judged women's attractiveness as long-term, but not short-term, mates (Study 2). This finding suggests that the common information signaled by feminine facial and vocal characteristics is more important for men's long-term partner choices than their short-term partner choices.

Although our findings present new evidence for systematic variation in men's preferences for feminine women, the cause of this variation remains unclear. The correlation between men's preferences for femininity in women's faces and voices does not appear to reflect age-related or attractiveness-related variation in attractiveness judgments, suggesting that neither self-rated attractiveness nor age explain correlated male preferences for women's facial and vocal femininity. Indeed, that self-rated attractiveness did not predict men's femininity preferences in either domain is consistent with previous studies (Cornwell et al., 2006; Jones et al., 2007). Moreover, our use of a forced-choice method to assess men's femininity preferences means that the observed correlation between preferences for facial and vocal femininity cannot be explained by a possible general response bias whereby some participants may have been more willing to use extreme values on response scales. Similarly, that the correlation was evident for men's judgments of women's attractiveness as long-term, but not short-term, mates (Study 2) suggests that correlated preferences for femininity in women's faces and voices is not due to a general response bias whereby some men attended to the task more than others did. These points raise the important question of what factors do contribute to individual differences in men's preferences for feminine characteristics in women. One possibility is that this systematic variation in femininity preferences is a consequence of variation among men in their testosterone levels and/or own masculinity. Previous research has shown that increases in men's testosterone levels are associated with increases in their preferences for feminine characteristics in women's faces (Welling et al., 2008) and that sensation seeking, a trait

that is positively correlated with both men's facial masculinity and testosterone levels (Campbell et al., 2010), is positively correlated with the strength of men's preferences for feminine women (Jones et al., 2007). Such variation in men's femininity preferences may be adaptive if masculine men or men with high levels of testosterone are better able to attract feminine mates (Jones et al., 2007). Another possibility is that individual differences in men's preferences for feminine women reflect variation among men in their sexual strategy (Glassenberg, Feinberg, Jones, Little and DeBruine, in press). The causes and function of systematic variation in men's femininity preferences are an important topic for future research.

We found that, while men typically demonstrate strong preferences for feminine characteristics in women's faces and voices, the strength of these face and voice preferences are positively correlated among men (Study 1), especially when judging women's attractiveness as long-term mates (Study 2). While these findings present novel evidence for systematic variation in men's femininity preferences, they are also consistent with the proposal that feminine characteristics in women's faces and voices may be cues to a common underlying quality (see also Feinberg et al., 2005a and Feinberg, 2008). While most previous research on individual differences in mate preferences has focused on variation among women in their preferences for male traits, the current studies add to a growing body of evidence for analogous variation in men's preferences for female traits. We suggest that further research focusing on identifying the causes and function of systematic variation in men's mate preferences will prove to be a fruitful research topic that may provide important insights into the evolution of human mating systems.

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