Experimental Psychology 59(6) © 2010 by Hogrefe Publishing.
http://dx.doi.org/10.1027/1618-3169/a000162

Social support influences preferences for feminine facial cues in potential social partners

Christopher D Watkins[1], Lisa M DeBruine[1], Anthony C Little[2] & Benedict C Jones[1]

[1] Face Research Laboratory, School of Psychology, University of Aberdeen, Aberdeen, AB24 3FX, Scotland, UK.

[2] School of Natural Sciences, University of Stirling, Stirling, FK9 4LA, Scotland, UK.

Corresponding authors

Christopher D Watkins, University of Aberdeen, Scotland, UK.

Tel: +44 (0)1224 273933

Fax: +44 (0)1224 273426

Email: r01cdw9@abdn.ac.uk

Social support influences preferences for feminine facial cues in potential social partners

Abstract

Most previous studies of individual differences in women's and men's preferences for sexually dimorphic physical characteristics have focused on the importance of mating-related factors for judgments of opposite-sex individuals. Although studies have suggested that people may show stronger preferences for feminine individuals of both sexes under conditions where social support may be at a premium (e.g., during phases of the menstrual cycle where raised progesterone prepares women's bodies for pregnancy), these studies have not demonstrated that perceptions of available social support directly influence femininity preferences. Here we found that (1) women and men randomly allocated to *low* social support priming conditions demonstrated stronger preferences for feminine shape cues in own- and opposite-sex faces than did individuals randomly allocated to *high* social support priming conditions and (2) that people perceived men and women displaying feminine characteristics as more likely to provide them with high-quality social support than those displaying relatively masculine characteristics. Together, these findings suggest that social support influences face preferences directly, potentially implicating facultative responses whereby people increase their preferences for pro-social individuals under conditions of low social support.

Introduction

Recent studies suggest that masculine and feminine physical characteristics are associated with a wide range of traits in men and women (see Little, Jones & DeBruine, 2011 and Puts, 2010 for recent reviews). For example, several studies have demonstrated that individuals displaying relatively feminine facial characteristics tend to be ascribed pro-social personality characteristics, such as emotional warmth and stronger parental tendencies, while individuals displaying relatively masculine facial characteristics tend to be ascribed anti-social personality characteristics, such as dominance and untrustworthiness (e.g., Perrett et al., 1998). Moreover, other research suggests that many of these personality attributions may be somewhat accurate (e.g., Law Smith et al., in press; Roney, Hanson, Durante & Maestripieri, 2006). While these findings suggest that masculine and feminine physical characteristics may signal aspects of men's and women's personalities, they may also signal aspects of physical condition. For example, some research suggests that exaggerated sex-typical characteristics in men and women (i.e., masculine characteristics in men and feminine characteristics in women) are positively correlated with measures of men's and women's long-term health (e.g., Thornhill & Gangestad, 2006) and other putative health cues (e.g., Little et al., 2008), while other work suggests that masculine characteristics are positively correlated with measures of physical strength (Fink, Neave & Seydel, 2007; Puts, Apicella & Cardenas, 2011; see also Sell et al., 2009). Collectively, these findings highlight the potentially important role that sexually dimorphic physical characteristics could play in signaling information that may be highly relevant to social interaction in

humans. However, it is important to note that, although studies have consistently demonstrated strong preferences for feminine characteristics in women's faces, preferences for masculine characteristics in men's faces are considerably more variable, with studies variously reporting preferences for masculine characteristics, preferences for feminine characteristics, and no effect of masculinity-femininity on men's facial attractiveness (for a meta-analytic review see Rhodes, 2006). These latter findings of variable attractiveness judgments of men's appear to reflect systematic individual differences in the type of men's faces that are considered optimally attractive (e.g., DeBruine et al., 2006).

To date, most research on individual differences in men's and women's preferences for sexually dimorphic physical characteristics in others has focused on mate preferences by examining individual differences in the importance people place on the traits signaled by sexually dimorphic characteristics in opposite-sex individuals (see Little et al., 2011 and Scott, Clark, Boothroyd & Penton-Voak, in press for recent reviews). For example, women appear to demonstrate stronger preferences for masculine men during the fertile phase of menstrual cycle than at other times, particularly when asked to assess men's attractiveness for hypothetical short-term, rather than long-term, relationships (e.g., Gangestad, Simpson & Cousins, 2004; Johnston, Hagel, Franklin, Fink & Grammer, 2001; Little & Jones, in press; Penton-Voak et al., 1999). A possible explanation for these findings is that, around ovulation, women place greater emphasis on cues to the physical condition of potential short-term mates that may be heritable (Gangestad et

al., 2004; Johnston et al., 2001; Little & Jones, in press; Penton-Voak et al., 1999), although this interpretation remains somewhat controversial (see Jones et al., 2008 and Scott et al., in press for discussion). Other studies have reported that men and women reporting higher levels of sexual desire demonstrate stronger preferences for exaggerated sex-typical characteristics in opposite-sex faces (Jones, Little, Watkins, Welling & DeBruine, 2011; Welling, Jones & DeBruine, 2008a) and that these preferences are also stronger when participants' salivary testosterone levels are high than when their salivary testosterone levels are relatively low (Welling et al., 2007, 2008b; see also Roney, Simmons & Gray, 2011[1]). Together these findings also suggest that individual differences in preferences for sexually dimorphic characteristics are shaped, at least partly, by mating-related factors, such as sex drive and associated hormone levels.

While most previous studies of individual differences in preferences for sexually dimorphic physical characteristics have focused on the importance of mating-related factors and judgments of opposite-sex individuals, there may also be substantial benefits to forming social alliances with both own-sex and opposite-sex individuals displaying cues to pro-social personality traits (for recent reviews see Barclay, 2011 and Queller, 2011). For example, individuals who form alliances with pro-social social partners may obtain reputational benefits associated with forming strong cooperative partnerships (e.g., Fehr, 2004) and/or benefit from the pooling of resources (e.g., Fehr &

[1] We note here that, although Roney et al. (2011) suggested that their effect of salivary testosterone level on women's masculinity preferences was not significant, the two-tailed p-value was <.10. Given the previous study by Welling et al. (2007), which had demonstrated a significant effect of testosterone level, a one-tailed test would be justified in Roney et al's study and would be significant. This is particularly noteworthy since Roney et al. (2011) tested approximately half as many women as Welling et al. (2007).

Gachter, 2002). Additionally, forming alliances with pro-social individuals may confer substantial benefits because of the large positive effect that social support has on long-term health outcomes. For example, a recent meta-analysis of longitudinal studies of the effects of social support on health outcomes found that individuals with good social support were 50% more likely to be alive at follow-up tests than were individuals with poor social support (Holt-Lunstad, Smith & Layton, 2010). Moreover, this effect of social support on survival rates was consistent across participant age, sex, initial health status, and length of follow-up period (Holt-Lunstad et al., 2010). Importantly, individuals with little social support may gain the most from prioritizing pro-social traits when assessing the suitability (i.e., attractiveness) of potential social partners, raising the possibility that social support could be an important factor in women's and men's preferences for feminine versus masculine individuals. Consistent with this proposal, some previous research has suggested that individuals may well demonstrate stronger preferences for feminine individuals under conditions where social support is likely to be at a premium, such as when they are primed with cues to harsh environments (Little, Cohen, Jones & Belsky, 2007), during menstrual cycle phases where raised progesterone levels prepare women's bodies for pregnancy (Jones et al., 2005), or when a particularly large family is planned (Moore, Law Smith, Cassidy & Perrett, 2009; Moore, Law Smith, Taylor & Perrett, 2011). Importantly, however, these studies presented no direct evidence that social support influences femininity preferences (Jones et al., 2005; Little et al., 2007; Moore et al., 2009, 2011) and have generally assessed participants'

preferences for femininity in potential mates only (Little et al., 2007; Moore et al., 2009, 2011).

The current experiment investigated the role of social support in men's and women's preferences for feminized versus masculinized versions of own-sex and opposite-sex faces. Specifically, we investigated if men's and women's preferences for feminized versus masculinized faces can be altered by randomly allocating participants to priming conditions in which they were instructed to imagine a time when they either received a great deal of social support from their friends or family (high social support conditions) or received very little social support from their friends or family (low social support conditions). If social support plays a direct role in preferences for feminine individuals, one would expect that participants in the low social support conditions would show stronger preferences for feminine individuals than participants in the high social support conditions. An important advantage of using this type of priming paradigm is that it allows for firm conclusions to be drawn about the nature of the causal link between social support and attractiveness judgments.

Methods

Participants

One hundred and six participants (76 women and 30 men; mean age = 22.3 years, *SD* = 4.61 years) took part in our main experiment. These participants were recruited for an online study of face perception by following links from social bookmarking Web sites (e.g., stumbleupon). Prior research has

established that lab-based and online studies of face perception produce very similar patterns of results (e.g., Conway, Jones, DeBruine & Little, 2008; Wilson & Daly, 2004; Senior et al., 1999a, 1999b).

Face stimuli

Following previous studies of perceptions of masculine versus feminine faces (e.g., DeBruine et al., 2006; DeBruine, Jones, Smith & Little 2010), we used prototype-based image transformations to objectively 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 et al., 2001), these methods have been shown to produce effects on person perception that are equivalent to those produced using the methods in our current study (see, e.g., DeBruine et al., 2006, 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, 2010; Penton-Voak et al., 1999; Welling et al., 2007). 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 & Perrett, 1995 and Tiddeman, Burt & Perrett, 2001 for

technical details). Here, a male prototype was manufactured by averaging the shape, color, and texture information from face images of 20 young White men (mean age = 19.5 years, *SD* = 2.3 years). A female prototype was manufactured by averaging the shape, color, and texture information from face images of 20 young White women (mean age = 18.4 years, *SD* = 0.7 years).

Next, 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 10 young White men (mean age = 21.4 years, *SD* = 5.4 years) and 10 young White women (mean age = 18.1 years, *SD* = 0.7 years). This process created masculinized and feminized versions of each individual face image. The masculinized and feminized versions differed in sexual dimorphism of 2D shape and were matched in other regards (e.g., identity, skin color and texture, Rowland & Perrett, 1995). Examples of masculinized and feminized face images are shown in Figure 1. Thus, 20 pairs of images were produced in total, consisting of 10 pairs of female face images and 10 pairs of male face images (each pair consisting of a masculinized and a feminized version of the same individual).

FIGURE 1 AROUND HERE

Manipulation check 1: Does manipulating face shape alter masculinity and femininity perceptions?

To establish whether our masculinized and feminized face stimuli differed in perceived masculinity-femininity in the intended manner, we presented the 20 pairs of images (each pair consisting of a masculinized and a feminized version of the same individual) in a fully randomized order to participants (38 women, 20 men; mean age = 21.90 years, *SD* = 4.04 years). The side of the screen on which any given image was presented was also randomized. Half of the participants were instructed to indicate which image in each pair looked more masculine and the other half were instructed to indicate which image in each pair looked more feminine. None of the participants who took part in this manipulation check participated in the main experiments.

One-sample t-tests showed that the proportion of trials on which participants who were asked to judge the femininity of the face images correctly identified the feminized versions was significantly greater than the chance value of 0.5 for judgments of both women's faces ($t(28) = 18.0$, $p < .001$, $M = .92$, $SEM = .02$, $d = 3.33$) and men's faces ($t(28) = 103.0$, $p < .001$, $M = .99$, $SEM = .01$, $d = 19.1$). Similarly, the proportion of trials on which participants who were asked to judge the masculinity of the face images correctly identified the masculinized versions was significantly greater than chance for judgments of both women's faces ($t(28) = 8.46$, $p < .001$, $M = .86$, $SEM = .04$, $d = 1.57$) and men's faces ($t(28) = 12.1$, $p < .001$, $M = .94$, $SEM = .04$, $d = 2.25$). These findings demonstrate that our methods for manipulating sexually dimorphic aspects of 2D face shape produce stimuli that differ in perceived masculinity-femininity in the intended manner (see also, e.g., DeBruine et al., 2006, 2010; Jones et al., 2010).

241

242 ***Manipulation check 2: Does manipulating face shape alter social***
243 ***support perceptions?***

244 We undertook an additional manipulation check to establish whether
245 individuals displaying feminized facial characteristics were perceived as more
246 supportive. Each participant (92 women, 49 men; mean age = 21.85 years,
247 *SD* = 4.82 years) was shown the 20 pairs of faces (each pair consisting of a
248 masculinized and feminized version of the same face) and were instructed to
249 click on the face of the person they thought would be more likely to provide
250 them with social support or that they thought would provide them with better
251 quality social support. The order in which the pairs of face images were
252 shown was fully randomized, as was the side of the screen on which the
253 masculinized and feminized versions were presented.

254

255 One-sample t-tests showed that participants perceived feminine individuals as
256 more likely to provide them with social support than masculine individuals
257 when judging both women's faces (M = .67, SEM = .03, $t(65) = 5.96$, $p < .001$,
258 d = 0.73) and men's faces (M = .68, SEM = .02, $t(65) = 7.52$, $p < .001$, d =
259 0.93). Similarly, participants perceived feminine individuals as likely to provide
260 them with better quality social support than masculine individuals when
261 judging both women's faces (M = .68, SEM = .02, $t(74) = 8.60$, $p < .001$, d =
262 1.03) and men's faces (M = .70, SEM = .02, $t(74) = 9.16$, $p < .001$, d = 1.06).
263 These findings confirm that feminine facial characteristics influence support-
264 related perceptions.

265

Procedure

The main experiment consisted of two parts; an initial priming phase and, subsequently, a femininity preference test.

In the initial priming phase of the experiment, each participant was randomly allocated to one of four conditions: a condition where they were instructed to imagine a scenario where they received a lot of support from their family (N=30), a condition where they were instructed to imagine a scenario where they received little support from their family (N=26), a condition where they were instructed to imagine a scenario where they received a lot of support from their friends (N=18), or a condition where they were instructed to imagine a scenario where they received little support from their friends (N=32). Participants were given the following instructions: “Please take a moment to imagine a time when you felt very [close to/isolated from] your [family/friends] and felt that you received [a lot of/little] emotional support from them.” They then rated how vividly they had imagined the scenario on a 1 (not very vivid) to 7 (very vivid) scale (mean = 4.35, SD = 2.16). Recent work on the effects of imagery on perception has shown that participants can accurately rate the vividness of their mental imagery (Pearson, Rademaker & Tong, 2011). Our priming paradigm was adapted from that used by Smith, Ruiz and Uchino (2004) to prime social support schema. We included *source of support* (family, friends) as a factor in our experimental design because some researchers have proposed that the source of support may be important for the strength of the relationships between social support and health factors, though empirical findings on this point have been mixed (see Thoits, 1995). Additionally, we

emphasized emotional support in our priming manipulation because many studies have identified emotional support as being a particularly important facet of social support (reviewed in Uchino, Cacioppo & Kiecolt-Glaser, 1996).

Immediately after the initial priming phase of the experiment, participants completed a femininity preference test. The method we used to assess individual differences in preferences for feminized versus masculinized versions of faces has been used in many previous studies of systematic variation in face preferences (e.g., Buckingham et al., 2006; Welling et al., 2008b). Participants were shown the 20 pairs of faces and were instructed to indicate which face in each pair they thought was the more attractive. Participants were also instructed to indicate how much more attractive they thought the chosen face was (relative to the other face in the pair) by choosing from the options “much more attractive”, “more attractive”, “somewhat more attractive”, and “slightly more attractive”. The order in which the pairs of face images were shown was fully randomized, as was the side of the screen on which the masculinized and feminized versions were presented.

Initial processing of data

Following many previous studies of individual differences in face preferences (e.g., Buckingham et al., 2006; Welling et al., 2008b), responses on the face preference test were coded using the following scale:

0 to 3: masculinized face rated ‘much more attractive’ (=0), ‘more attractive’ (=1) ‘somewhat more attractive’ (=2) or ‘slightly more attractive’ (=3) than feminized face.

4 to 7: feminized face rated ‘slightly more attractive’ (=4), ‘somewhat more attractive’ (=5), ‘more attractive’ (=6) or ‘much more attractive’ (=7) than masculinized face.

For each participant, we calculated their average score for judgments of the 10 male faces. Separately, we also calculated their average score for judgments of the 10 female faces. These femininity preference scores were used in subsequent analyses. Higher scores indicate stronger attraction to feminized faces. These data are summarized in Table 1.

INSERT TABLE 1 AROUND HERE

Results

One-sample t-tests comparing scores on the face preference test with what would be expected by chance alone (i.e., 3.5) showed that participants generally rated feminized versions of women’s faces as more attractive than masculinized versions ($t(105) = 12.0$, $p < .001$, $M = 4.23$, $SEM = .06$, $d = 1.16$). By contrast, scores for men’s faces were not significantly different from chance ($t(105) = 0.12$, $p = .91$, $M = 3.51$, $SEM = .07$, $d = 0.01$). Similar results were obtained when we analyzed men’s and women’s responses separately; both sets of analyses revealed significant effects of femininity on perceptions

of women's, but not men's, facial attractiveness. These findings are consistent with previous work that has consistently demonstrated strong preferences for feminine characteristics in women's faces, but has shown preferences for masculinity-femininity in men's faces to be considerably more variable (for a meta-analytic review see Rhodes, 2006). This variability appears to reflect systematic variation in the extent to which people prefer masculine or feminine men (see Little et al., 2011 for a recent review of possible sources of these individual differences).

Next, we carried out a mixed-design ANOVA with *sex of face* (male, female) as a within-subjects factor and *source of support* (family, friends), *quantity of support* (high, low), and *participant sex* (male, female) as between-subjects factors. This analysis revealed a significant effect of *sex of face* ($F(1,98) = 52.5$, $p < .001$, partial $eta^2 = .35$), whereby preferences for femininity in women's faces ($M = 4.23$, $SEM = .06$) were significantly stronger than preferences for femininity in men's faces ($M = 3.51$, $SEM = .07$). We also observed a significant main effect of *quantity of support* ($F(1,98) = 5.76$, $p = .018$, partial $eta^2 = .06$), whereby participants allocated to the low social support priming conditions subsequently demonstrated stronger preferences for feminized faces ($M = 3.95$, $SEM = 0.07$) than did participants allocated to the high social support priming conditions ($M = 3.77$, $SEM = 0.07$). When analyzing judgments of men's and women's faces separately, one-sample t-tests against the chance value of 3.5 showed that participants preferred feminized to masculinized versions of women's faces in both the low ($t(57) = 9.58$, $p < .001$, $d = 1.25$) and high ($t(47) = 7.27$, $p < .001$, $d = 1.04$) social

support priming conditions. Corresponding t-tests for judgments of men's faces showed that participants tended to prefer feminized to masculinized versions in the low social support priming conditions ($t(57) = 1.43$, $p = .15$, $d = 0.18$) and tended to prefer masculinized to feminized versions in the high social support priming conditions ($t(47) = -1.57$, $p = .12$, $d = 0.22$), though neither preference was significantly different from chance. A main effect of *participant sex*, whereby women's femininity preferences ($M = 3.91$, $SEM = .05$) tended to be stronger than men's ($M = 3.78$, $SEM = .12$), approached significance ($F(1,98) = 3.13$, $p = .080$, partial $eta^2 = .03$). A three-way interaction among *sex of face*, *source of support*, and *participant sex* also approached significance ($F(1,98) = 3.08$, $p = .082$, partial $eta^2 = .03$). Because we had not predicted this interaction, and because it did not involve our main factor of interest (*quantity of support*), we did not explore it further. No other main effects or interactions among any of our variables were significant or approached significance (all $F(1,98) < 1.77$, all $p > .18$, all partial $eta^2 < .02$).

The main effect of *quantity of support* remained significant when *vividness ratings* were included as a covariate ($F(1,97) = 6.34$, $p = .013$, partial $eta^2 = .06$). This latter finding indicates that the effect of *quantity of support* on face preferences was not an artifact of differences in the vividness with which participants imagined the different priming scenarios.

Discussion

We found that individuals randomly allocated to the low social support priming conditions demonstrated stronger preferences for feminine faces than did

individuals randomly allocated to the high social support priming conditions. In our manipulation checks (see Methods), we also showed that participants perceived men and women displaying feminized facial characteristics to be more likely to provide them with high-quality social support than individuals displaying masculinized facial characteristics. Collectively, these findings suggest that preferences for pro-social individuals are increased under conditions of low social support and that perceptions of available social support play a potentially important role in individual differences in face preferences. Importantly, the priming effects observed in our main experiment were equivalent for judgments of own-sex and opposite-sex individuals, suggesting that they reflect general preferences for potential social partners, rather than more specific preferences that are primarily relevant to assessments of potential mates. Note, however, that while participants demonstrated significant preferences for feminized versions of women's faces in both the high and low support conditions, preferences for feminine versus masculine men did not differ significantly from chance in either of these conditions. This pattern of results is consistent with prior work demonstrating that sexually dimorphic shape cues have greater effects on women's than men's facial attractiveness (see, e.g., Rhodes, 2006).

Stronger attraction to feminine individuals in the low social support conditions suggest facultative responses whereby preferences for supportive social partners are increased under conditions of low social support. Such facultative responses may be adaptive because of the benefits that appear to be associated with forming alliances with supportive individuals, such as the

reputational benefits associated with forming strong cooperative partnerships (e.g., Fehr, 2004), the pooling of resources (e.g., Fehr & Gachter, 2002), and substantially increased long-term health (for a meta-analytic review see Holt-Lunstad et al., 2010). While previous research on individual differences in preferences for sexually dimorphic cues in faces has tended to focus on mate preferences (see Little et al., 2011 and Scott et al., in press for reviews), here we emphasize the effects of social support on assessments of the attractiveness of both own- and opposite-sex individuals. While some previous studies have presented indirect evidence that individuals demonstrate stronger preferences for feminine individuals under conditions where social support is likely to be at a premium, such as when raised progesterone during the luteal (non-fertile) phase of the menstrual cycle prepares women's bodies for pregnancy (Jones et al., 2005), under harsh environmental conditions (Little et al., 2007), or when a particularly large family is desired (Moore et al., 2009, 2011), ours is the first experiment that we are aware of to present evidence that perceptions of available social support directly influence face preferences. Moreover, our findings complement those from other recent work suggesting compensatory responses under conditions of low social support, whereby people are more likely to attend to signals of social acceptance when they feel socially excluded (DeWall, Maner & Rouby, 2009) and are more likely to trust others when their romantic relationships are under stress (Koranyi & Rothermund, 2012). Thus, our findings add to a growing literature demonstrating compensatory behavioral responses to support-related social factors. Although the priming effect in the current experiment was relatively small, the

small effect size elicited by this ‘minimal manipulation’ suggests that the corresponding effect in the real world could well be substantial (see Prentice & Miller, 1992 for discussion).

Although the current experiments suggest that participants in post-industrialized societies perceive feminine individuals to be particularly supportive and modulate their femininity preferences in response to social support factors, the extent to which these findings generalize to other populations is unknown. While some work has shown that attributions of behavioral characteristics to individuals based on facial cues alone can be somewhat stable across cultures (e.g., Perrett et al., 1998), the possibility that there may be differences in these attributions between more diverse cultures has received relatively little attention. We suggest that cross-cultural work on both personality attributions and the role of social support in face preferences may prove to be a fruitful line of inquiry for future research. Indeed, while a lack of social support appears to increase preferences for cues of pro-sociality in relatively predictable, and therefore relatively safe, environments, lack of social support in less predictable environments may increase preferences for cues associated with different factors, such as markers of resource holding potential. We suggest that investigating how these environmental factors interact with the effects of social support observed in the current experiments is also likely to be a fruitful line of research.

In conclusion, our results show that priming participants by having them imagine scenarios in which they received either a great deal of or little social

support modulates their preferences for facial cues associated with perceived pro-sociality (i.e., feminine shape cues) in men's and women's faces. We suggest that these findings are likely to reflect facultative responses that may have evolved to increase the potential benefits available from forming alliances with pro-social individuals when social support was otherwise lacking. More fundamentally, our data present direct evidence that social support helps to shape the extent to which we value potential cues to pro-sociality in social partners.

References

Barclay, P. (2011). Competitive helping increases with the size of biological markets and invades defection. *Journal of Theoretical Biology*, *281*, 47-55.

Buckingham, G., DeBruine, L. M., Little, A. C., Welling, L. L. M., Conway, C. A., Tiddeman, B. P. & Jones, B. C. (2006). Visual adaptation to masculine and feminine faces influences generalized preferences and perceptions of trustworthiness. *Evolution and Human Behaviour, 27*, 381-389.

Conway, C. A., Jones, B. C., DeBruine, L. M. & Little, A. C. (2008). Evidence for adaptive design in human gaze preference. *Proceedings of the Royal Society of London B*, *275*, 63-69.

DeBruine, L. M., Jones, B. C., Smith, F. G. & Little, A. C. (2010). Are attractive men's faces masculine or feminine? The importance of controlling confounds in face stimuli. *Journal of Experimental Psychology: Human Perception and Performance. 36*, 751-758.

DeBruine, L. M., Jones, B. C., Little, A. C., Boothroyd, L. G., Perrett, D. I., Penton-Voak, I. S., Cooper, P. A., Penke, L., Feinberg, D. R. & Tiddeman, B. P. (2006). Correlated preferences for facial masculinity and ideal or actual partner's masculinity. *Proceedings of the Royal Society of London B, 273*, 1355-1360.

DeWall, C. N., Maner, J. K. & Rouby, D. A. (2009). Social exclusion and early-stage interpersonal perception: Selective attention to signs of acceptance. *Journal of Personality and Social Psychology*, *96*, 729-741.

Fehr, E. (2004). Don't lose your reputation. *Nature*, *432*, 449-450.

Fehr, E. & Gachter, S. (2002). Altruistic punishment in humans. *Nature*, *415*, 137-140.

Fink, B., Neave, N. & Seydel, H. (2007). Male facial appearance signals physical strength to women. *American Journal of Human Biology*, *19*, 82-87.

Gangestad, S. W., Simpson, J. A. & Cousins, A. J. (2004). Women's preferences for male behavioural displays change across the menstrual cycle. *Psychological Science, 15*, 203-207.

Holt-Lunstad, J., Smith, T. B. & Layton, J. B. (2010). Social relationships and mortality risk: A meta-analytic review. *PLoS Medicine, 7*, e1000316.

Johnston, V. S., Hagel, R., Franklin, M., Fink, B. & Grammer, K. (2001). Male facial attractiveness: evidence for hormone mediated design. *Evolution and Human Behaviour, 23*, 251-267.

Jones, B.C., DeBruine, L. M., Main, J.C., Little, A.C., Welling, L.L.M., Feinberg, D.R. & Tiddeman, B.P. (2010). Facial cues of dominance modulate the short-term gaze-cuing effect in human observers. *Proceedings of the Royal Society of London B, 277*, 617-624.

Jones, B. C., Little, A. C., Watkins, C. D., Welling, L. L. M. & DeBruine, L. M. (2011). Reported sexual desire predicts men's preferences for sexually dimorphic cues in *women's faces. Archives of Sexual Behavior*, *40*, 1281-1285.

Jones, B. C., DeBruine, L. M., Perrett, D. I., Little, A. C., Feinberg, D. R. & Law Smith, M. J. (2008). Effects of menstrual cycle phase on face preferences. *Archives of Sexual Behaviour*, *37*, 78-84.

Jones, B. C., Little, A. C., Boothroyd, L. G., DeBruine, L. M., Feinberg, D. R., Law Smith, M. J., Cornwell, R. E., Moore, F. R. & Perrett, D. I. (2005). Commitment to relationships and preferences for femininity and apparent health in faces are strongest on days of the menstrual cycle when progesterone level is high. *Hormones and Behavior, 48,* 283-290.

Koranyi, N. & Rothermund, K. (2012). Automatic coping mechanisms in committed relationships: Increased interpersonal trust as a response to stress. *Journal of Experimental Social Psychology*, *48*, 180-185.

Law-Smith, M. J., Deady, D. K., Moore, F. R., Jones, B. C., Cornwell, R. E., Stirrat, M. R., Lawson, J., Feinberg, D. R. & Perrett, D. I. (in press). Maternal tendencies in women are associated with estrogen levels and facial femininity. *Hormones and Behavior*.

Little, A. C. & Jones, B. C. (in press). Variation in facial masculinity and symmetry preferences across the menstrual cycle is moderated by relationship context. *Psychoneuroendocrinology*.

Little, A. C., Jones, B. C. & DeBruine, L. M. (2011). Facial attractiveness: Evolutionary based research. *Philosophical Transactions of the Royal Society B*. in press.

Little, A. C., Jones, B. C., Waitt, C., Tiddeman, B. P., Feinberg, D. R., Perrett, D. I., Apicella, C. A. & Marlowe, F. W. (2008). Symmetry is related to sexual dimorphism in faces: Data across culture and species. *PLoS One*, *3*, 2106.

Little, A. C., Cohen, D. L., Jones, B. C. & Belsky, J. (2007). Human preferences for facial masculinity change with relationship type and

environmental harshness. *Behavioral Ecology and Sociobiology*, *61*, 967-973.

Moore, F. R., Law-Smith, M. J., Taylor, V. & Perrett, D. I. (2011). Sexual dimorphism in the female face is a cue to health and social status but not age. *Personality and Individual Differences*, *50*, 1068-1073.

Moore, F. R., Law-Smith, M. J., Cassidy, C. & Perrett, D. I. (2009). Female reproductive strategy predicts preferences for sexual dimorphism in male faces. *Journal of Evolutionary Psychology*, *7*, 211-224.

Pearson, J., Rademaker, R. & Tong, F. (2011). Evaluating the mind's eye: The metacognition of visual imagery. Psychological Science, in press.

Penton-Voak, I. S., Perrett, D. I., Castles, D., Burt, M., Koyabashi, T. & Murray, L. K. (1999). Female preference for male faces changes cyclically. *Nature, 399*, 741-742.

Perrett, D. I., Lee, K. J., Penton-Voak, I. S., Rowland, D. R., Yoshikawa, S., Burt, D. M., Henzi, S. P., Castles, D. I. & Akamatsu, S. (1998). Effects of sexual dimorphism on facial attractiveness. *Nature, 394*, 884-887.

Prentice, D. A. & Miller, D. T. (1992). When small effects are impressive. *Psychological Bulletin, 112*, 160-164.

Puts, D. A., Apicella, C. L. & Cardenas, R. A. (2011). Masculine voices signal men's threat potential in foraging and industrial societies. Proceedings of the Royal Society of London B, DOI: 10.1098/rspb.2011.0829.

Puts, D. A. (2010). Beauty and the beast: Mechanisms of sexual selection in humans. *Evolution and Human Behavior*, *31*, 157-175.

571 Queller, D. C. (2011). Expanded social fitness and Hamilton's rule for kin, kith,
572 and kind. *Proceedings of the National Academy of Sciences*, *108*,
573 10792-10799.
574 Rhodes, G. (2006). The evolutionary psychology of facial beauty. *Annual*
575 *Review of Psychology*, *57*, 199-226.
576 Roney, J. R., Simmons, Z. L. & Gray, P. B. (2011). Changes in estradiol
577 predict within-women shifts in attraction to facial cues of men's
578 testosterone. *Psychoneuroendocrinology*, *36*, 742-749.
579 Roney, J. R., Hanson, K. N., Durante, K. M. & Maestripieri, D. (2006).
580 Reading men's faces: women's mate attractiveness judgments track
581 men's testosterone and interest in infants. *Proceedings of the Royal*
582 *Society of London B*, *273*, 2169-2175.
583 Rowland, D. A. & Perrett, D. I. (1995). Manipulating facial appearance through
584 shape and colour. IEEE Computer Graphics and Applications, *15*, 70-
585 76.
586 Scott, I. M. L., Clark, A. P., Boothroyd, L. G. & Penton-Voak, I. S. (in press).
587 Do men's faces really signal heritable immunocompetence? *Behavioral*
588 *Ecology.*
589 Sell, A., Cosmides, L., Tooby, J., Sznycer, D., von Reuden, C., Gurven, M.
590 (2009). Human adaptations for the visual assessment of strength and
591 fighting ability from the body and face. *Proceedings of the Royal*
592 *Society of London B*, *276*, 575-584.
593 Senior, C., Barnes, J., Jenkins, R., Landau, S., Philips, M. L. & David, A. S.
594 (1999a). Attribution of social dominance and maleness to schematic
595 faces. *Social Behavior and Personality*, *27*, 331–338.

Senior, C., Philips, M. L., Barnes, J. & David, A. S. (1999b). An investigation into the perception of dominance from schematic faces: A study using the World-Wide Web. *Behavior Research Methods, Instruments and Computers, 31*,341–346.

Smith, T. W., Ruiz, J. M. & Uchino, B. N. (2004). Mental activation of supportive ties, hostility, and cardiovascular reactivity to laboratory stress in young men and women. *Health Psychology*, *23*, 476-485.

Thoits, P. A. (1995). Stress, coping and social support processes: Where are we? What next? *Journal of Health and Social Behavior*, *36*, 53-79.

Thornhill, R. & Gangestad, S. W. (2006). Facial sexual dimorphism, developmental stability, and susceptibility to disease in men and women. *Evolution and Human Behaviour, 27*, 131-14.

Tiddeman, B. P., Burt, D. M. & Perrett, D. I. (2001). Prototyping and transforming facial texture for perception research. IEEE *Computer Graphics and Applications, 21*, 42-50.

Uchino, B. N., Cacioppo, J. T. & Kiecolt-Glaser, J. K. (1996). The relationship between social support and physiological processes: a review with emphasis on underlying mechanisms and implications for health. *Psychological Bulletin, 119*, 488-531.

Welling, L. L. M., Jones, B. C. & DeBruine, L. M. (2008a). Sex drive is positively associated with women's preferences for sexual dimorphism in men's and women's faces. *Personality and Individual Differences*, *44*, 161-170.

Welling, L. L. M., Jones, B. C., DeBruine, L. M., Smith, F. G., Feinberg, D. R., Little, A. C. & Al-Dujaili, E. A. S. (2008b). Men report stronger attraction

621 to femininity in women's faces when their testosterone levels are high.
622 *Hormones and Behavior, 54*, 703-708.
623 Welling, L. L. M., Jones, B. C., DeBruine, L. M., Conway, C. A., Law Smith, M.
624 J., Little, A. C., Feinberg, D. R., Sharp, M. & Al-Dujaili, E. A. S. (2007).
625 Raised salivary testosterone in women is associated with increased
626 attraction to masculine faces. *Hormones and Behaviour, 52*, 156-161.
627 Wilson, M. & Daly, M. (2004). Do pretty women inspire men to discount the
628 future? *Proceedings of the Royal Society of London B*, *271*, S177-
629 S179.
630

631 **Table 1.** Mean femininity preference (standard deviation given in brackets) for
632 each condition in our main experiment (3.5 = chance level, i.e., no overall
633 femininity preference). See main text for a full explanation of how the
634 preference score was calculated.
635

	high support		**low support**	
	family	friends	family	friends
		female participants		
male faces	3.56 (0.67)	3.30 (0.43)	3.78 (0.72)	3.61 (0.83)
female faces	4.13 (0.71)	4.33 (0.53)	4.23 (0.60)	4.30 (0.55)
		male participants		
male faces	2.99 (0.90)	2.97 (0.91)	3.59 (0.87)	3.54 (0.70)
female faces	4.39 (0.70)	3.53 (0.71)	4.25 (0.72)	4.26 (0.73)

636
637

638 **Figure 1.**

639

640 **Figure 1.** Examples of masculinized and feminized versions of face images

641 used in our experiments.