



Sexual dimorphism of male face shape, partnership status and the temporal context of relationship sought modulate women's preferences for direct gaze

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Most previous studies of face preferences have investigated the physical cues that influence face preferences. Far fewer studies have investigated the effects of cues to the direction of others' social interest (i.e. gaze direction) on face preferences. Here we found that unpartnered women demonstrated stronger preferences for direct gaze (indicating social interest) from feminine male faces than from masculine male faces when judging men's attractiveness for long-term relationships, but not when judging men's attractiveness for short-term relationships. Moreover, unpartnered women's preferences for direct gaze from feminine men were stronger for long-term than short-term relationships, but there was no comparable effect for judgements of masculine men. No such effects were evident among women with romantic partners, potentially reflecting different motivations underlying partnered and unpartnered women's judgements of men's attractiveness. Collectively these findings (1) complement previous findings whereby women demonstrated stronger preferences for feminine men as long-term than short-term partners, (2) demonstrate context-sensitivity in the integration of physical and social cues in face preferences, and (3) suggest that gaze preferences may function, at least in part, to facilitate efficient allocation of mating effort.

Masculine facial characteristics in men, such as large jaws and pronounced brows (Fink & Penton-Voak, 2002), are positively associated with their testosterone levels (Penton-Voak & Chen, 2004; Roney, Hanson, Durante, & Maestripieri, 2006). Masculine traits may signal men's long-term health if only men with strong immune systems can withstand the possible immunosuppressive effects of high testosterone levels and

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develop masculine traits (Fink & Penton-Voak, 2002; Gangestad & Simpson, 2000). Consistent with this proposal, ratings of men's facial masculinity are positively associated with their long-term health as estimated from medical records (Rhodes, Chan, Zebrowitz, & Simmons, 2003). Furthermore, masculinity of facial proportions is negatively associated with incidence and duration of respiratory disease among men (Thornhill & Gangestad, 2006). While these findings suggest that women's preferences for masculine men may be adaptive because they are associated with traits that are desirable in potential mates (i.e. good health), masculine facial characteristics are also associated with negative traits that are undesirable in a long-term romantic partner (Gangestad & Simpson, 2000). For example, masculine men are perceived as poor parents, dishonest and dominant (Boothroyd, Jones, Burt, & Perrett, 2007; Perrett *et al.*, 1998). Masculine men are also particularly interested in pursuing short-term sexual relationships (Rhodes, Simmons, & Peters, 2005). Thus, there appears to be a trade-off for women between the advantages and disadvantages of choosing a masculine male partner (Fink & Penton-Voak, 2002; Gangestad & Simpson, 2000; Jones, DeBruine *et al.*, 2008; Little, Jones, Penton-Voak, Burt, & Perrett, 2002). Differences in how women resolve this trade-off are thought to lead to systematic variation in women's preferences for masculine men (Fink & Penton-Voak, 2002; Gangestad & Simpson, 2000; Jones, DeBruine *et al.*, 2008; Little *et al.*, 2002).

Many sources of systematic variation in women's preferences for masculinity in men's faces have been identified by recent studies (see Fink & Penton-Voak, 2002 for a review). For example, women prefer more masculine men around ovulation than at other times in the menstrual cycle (e.g. Johnston, Hagel, Franklin, Fink, & Grammer, 2001; Jones, Little *et al.*, 2005; Penton-Voak *et al.*, 1999; Welling *et al.*, 2007). Women who perceive themselves as attractive also demonstrate stronger preferences for masculinity in men's faces than do women who perceive themselves as relatively less attractive (Little, Burt, Penton-Voak, & Perrett, 2001; Little & Mannion, 2006; see also Vukovic *et al.*, 2008 for corresponding variation in preferences for masculine voices). Additionally, the extent to which women prefer masculinity in men's faces varies as a function of the temporal context of the relationship sought. Women show stronger preferences for femininity when judging the attractiveness of men's faces for hypothetical long-term relationships than when judging the same men's faces for hypothetical short-term relationships (Little *et al.*, 2001, 2002; Penton-Voak *et al.*, 1999; Penton-Voak, Little, Jones, Burt, & Perrett, 2003). Different preferences for feminine men for long-term and short-term relationships may occur because the benefits associated with choosing a feminine partner (e.g. high investment and commitment) are more pronounced for long-term than short-term relationships (Little *et al.*, 2001, 2002; Penton-Voak *et al.*, 1999, 2003). This effect of relationship context on women's preferences for masculinity in men's faces highlights the context-sensitive nature of women's masculinity preferences and points to facultative responses that may maximise the possible benefits of women's mate preferences according to the desired relationship context (Little *et al.*, 2001, 2002; Penton-Voak *et al.*, 1999, 2003).

The studies of women's preferences for masculinity in men's faces described above have each used face stimuli with direct gaze. However, recent studies of face preferences have demonstrated that gaze direction also affects face preferences (Conway, Jones, DeBruine, & Little, 2008; Conway, Jones, DeBruine, Little, Hay *et al.*, 2008; Jones, DeBruine, Little, Conway, & Feinberg, 2006; Mason, Tatkov, & Macrae, 2005). For example, people typically demonstrate stronger preferences for

viewer-directed (i.e. direct) gaze over other-directed (i.e. averted) gaze when judging opposite-sex faces (Conway, Jones, DeBruine, & Little, 2008; Mason *et al.*, 2005). These preferences for direct gaze are also more pronounced for judgements of attractive individuals than for judgements of relatively unattractive individuals (Conway, Jones, DeBruine, & Little, 2008; Conway, Jones, DeBruine, Little, Hay *et al.*, 2008). Since direct gaze signals social interest in the target (Conway, Jones, DeBruine, & Little, 2008; Conway, Jones, DeBruine, Little, Hay *et al.*, 2008; Jones *et al.*, 2006; Mason *et al.*, 2005), this integration of gaze direction and other cues (i.e. attractiveness and sex) when forming face preferences may reflect adaptations for efficient allocation of mating effort (i.e. allocation of more mating effort to attractive potential mates who signal that they are willing to reciprocate, Conway, Jones, DeBruine, & Little, 2008; Conway, Jones, DeBruine, Little, Hay *et al.*, 2008; Jones *et al.*, 2006; Mason *et al.*, 2005). Consistent with this view that preferences for direct gaze function, at least in part, to facilitate efficient allocation of mating effort, studies have found that preferences for direct gaze are significantly stronger when judging opposite-sex faces than when judging own-sex faces (Conway, Jones, DeBruine, & Little, 2008; Mason *et al.*, 2005).

Previous studies have demonstrated that women's preferences for male faces with direct gaze are influenced both by sexual dimorphism of face shape and by the temporal context of the relationship sought (Little *et al.*, 2001, 2002; Penton-Voak *et al.*, 1999, 2003). Here we tested if the strength of women's preferences for direct (versus averted) gaze is also modulated by these factors. We compared the strength of women's preferences for direct gaze when judging feminised male faces for short-term and long-term relationships and when judging masculinised male faces for these relationship contexts. The benefits associated with choosing a feminine partner are thought to be more pronounced for long-term than short-term relationships, leading to stronger preferences for feminine men as long-term partners than as short-term partners (Little *et al.*, 2001, 2002; Penton-Voak *et al.*, 1999, 2003). Thus, we predicted that women would demonstrate stronger preferences for direct gaze (i.e. social interest) from feminine men than from masculine men when judging men's attractiveness for long-term relationships, but not when judging men's attractiveness for short-term relationships. We also predicted that women would show stronger preferences for direct gaze from masculine men when judging men's attractiveness for short-term relationships than when judging men's attractiveness for long-term relationships. Finally, since Little *et al.* (2002) found that women in romantic relationships have stronger masculinity preferences than unpartnered women, and because partnership status may affect how women judge men's attractiveness for short- and long-term relationships, we also investigated the effect of partnership status on women's gaze preferences by testing both partnered and unpartnered women.

Methods

Stimuli

First, we manufactured a male prototype face with direct gaze (the 'direct gaze' prototype) by averaging the shape, colour and texture information from full face photographs of twenty-four white males (age: $M = 20.52$ years, $SD = 4.57$ years) with direct gaze (see Tiddeman, Burt, & Perrett, 2001 for technical details of the computer graphic methods that were used to manufacture composite faces). Using the same methods, we also manufactured a prototype with averted gaze (the 'averted gaze'

prototype) by averaging photographs of the same twenty-four men, this time photographed with averted gaze. Participants were asked to avert their gaze towards a target on the wall at an approximate angle of 35 degrees to their right. The computer graphic methods we used to manufacture these prototypes have been used to manufacture stimuli in many previous studies of face perception (e.g. DeBruine, Jones, & Perrett, 2005; Jones, Little, Feinberg *et al.*, 2004; Jones, Little, Burt, & Perrett, 2004; Jones, Little *et al.*, 2005; Perrett *et al.*, 2002).

Following Jones *et al.* (2006), we then manufactured a 'transformed gaze' version of the 'direct gaze' prototype to create a version of the 'direct gaze' prototype in which the position of the irises had been transformed by 100% of the linear differences in 2D shape between the 'direct gaze' and 'averted gaze' prototype. This method for manipulating gaze direction in face images ensures that the 'direct gaze' and 'transformed gaze' prototypes differ only in the position of the irises and are identical in other regards, such as face shape (Jones *et al.*, 2006).

Finally, we manufactured masculinised and feminised versions of both the 'direct gaze' and 'transformed gaze' prototypes by adding or subtracting 50% of the linear differences in 2D shape between symmetrised male and female prototype faces. This sexual dimorphism continuum will reflect only those vector differences between male and female faces that are captured by the 179 landmark points used to define male and female face shape (see Perrett *et al.*, 1998; Bestelmeyer *et al.*, 2008). Many previous studies of preferences for sexual dimorphism have manufactured stimuli using this method (e.g. Buckingham *et al.*, 2006; DeBruine *et al.*, 2006; Little *et al.*, 2001, 2002; Penton-Voak *et al.*, 1999, 2003; Perrett *et al.*, 1998; Vukovic *et al.*, 2009; Welling *et al.*, 2007). Previous studies have shown that varying masculinity in this way affects perceptions of masculinity and dominance in the predicted way (DeBruine *et al.*, 2006; Welling *et al.*, 2007). DeBruine *et al.* (2006) also showed that masculinity stimuli made in this way produce face preferences that are equivalent to those that are elicited by masculinity stimuli manufactured using alternative computer graphic methods. Importantly, DeBruine *et al.* (2006) demonstrated that masculinity preferences assessed using the method used here predict the masculinity of women's actual romantic partner, indicating that masculinity preferences assessed using these methods are relevant to women's actual mate choices.

Thus, four prototype faces were manufactured in total, representing the following conditions: feminine male with direct gaze, feminine male with averted gaze, masculine male with direct gaze and masculine male with averted gaze. These four faces were paired to produce two pairs of faces that were matched on sexual dimorphism and differed only in gaze direction. These pairs of faces are shown in Figure 1. Using masculinised and feminised prototypes as stimuli in our study ensures that the masculinised versions are more masculine than average and that the feminised versions are more feminine than average (see, e.g. Perrett *et al.*, 1998). Furthermore, as many researchers have emphasised (e.g. Perrett *et al.*, 1998, 2002), using face prototypes as stimuli ensures that stimuli are optimally representative (i.e. prototypic) of the social category from which they were manufactured (i.e. young adult white men). Previous studies of gaze preference using a small number of face prototypes (e.g. Conway, Jones, DeBruine, & Little, 2008) and a larger number of individual faces (e.g. Mason *et al.*, 2005) have produced similar findings. Additionally, findings from studies of gaze preference that have used a small number of prototype images (Conway, Jones, DeBruine, Little, Hay *et al.*, 2008; Jones *et al.*, 2006) are consistent with findings from neurobiological studies of the reward value of facial cues of social interest (e.g. Kampe, Frith, Dolan, & Frith, 2001; O'Doherty *et al.*, 2003).

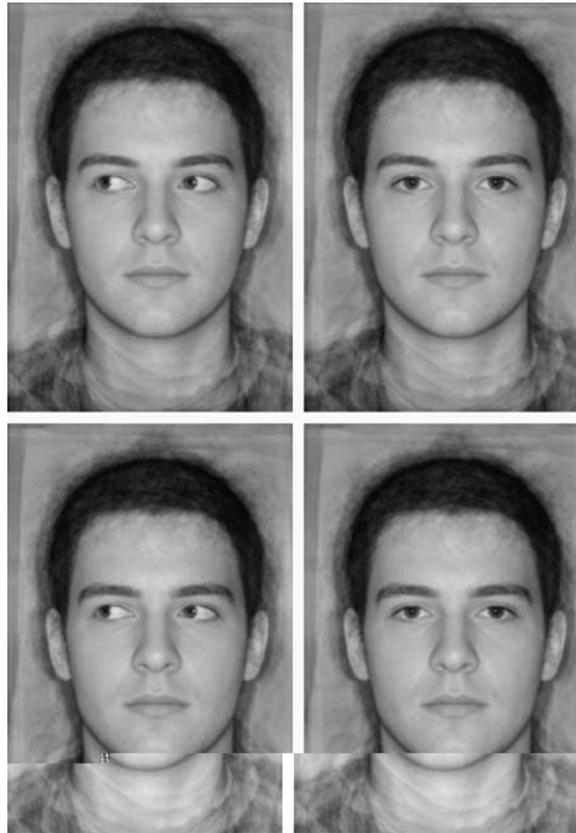


Figure 1. Pairs of faces used in our study. The top row shows a pair of feminised faces with direct and averted gaze. The bottom row shows a pair of masculinised faces with direct and averted gaze.

Manipulation check

To confirm that our manipulation of sexual dimorphism of face shape influenced perceptions of the masculinity of our face stimuli, 37 women (age: $M = 26.09$ years, $SD = 9.29$ years) were shown the masculinised and feminised faces with direct gaze and were asked to indicate which face was more masculine. The same women were also shown the masculinised and feminised faces with averted gaze and were, again, asked to indicate which face was more masculine. The order in which these pairs of faces were shown was fully randomised, as was the side of the screen on which any particular image was shown. Women choose the masculinised versions as the more masculine face more often than would be expected by chance alone when judging faces with direct ($p < .001$, proportion = .97) and averted ($p < .001$, proportion = .92) gaze. These findings confirm that masculinising face images increased perceptions of masculinity. This procedure was repeated with 30 different women (age: $M = 23.52$ years, $SD = 8.17$ years) who were asked to indicate which face in each pair looked more dominant. Analyses of these responses confirmed that the masculinised version was perceived as being more dominant for both the direct gaze ($p = .001$, proportion = .80) and the averted gaze ($p < .001$, proportion = .87) conditions.

Procedure

Four hundred and forty-nine heterosexual women (age: $M = 24.76$ years, $SD = 7.94$ years) took part in the study. Of these women, 193 reported that they currently had a romantic partner and 256 reported that they were currently single.

Preferences for direct gaze in masculine and feminine faces were assessed under two hypothetical relationship contexts: when judging men's attractiveness for a hypothetical short-term relationship and when judging men's attractiveness for a hypothetical long-term relationship. Preferences in each of these hypothetical relationship contexts were assessed in separate blocks of trials and the order of these blocks was randomised for each participant. Short-term and long-term relationships were defined at the start of each block using definitions that have been used in previous studies (e.g. DeBruine, 2005; Little, Cohen, Jones, & Belsky, 2007; Little & Mannion, 2006; Penton-Voak *et al.*, 2003).

A short-term relationship was defined as: 'You are looking for the type of person who would be attractive in a short-term relationship. This implies that the relationship may not last a long time. Examples of this type of relationship would include a single date accepted on the spur of the moment, an affair within a long-term relationship, and possibility of a one-night stand.'

A long-term relationship was defined as 'You are looking for the type of person who would be attractive in a long-term relationship. Examples of this type of relationship would include someone you may want to move in with, someone you may consider leaving a current partner to be with, and someone you may, at some point, wish to marry (or enter into a relationship on similar grounds as marriage).'

In each block of trials, participants were shown two pairs of male prototypes. The faces in each pair were matched in terms of sexual dimorphism but differed in gaze direction (see Figure 1 for these pairs). Participants were instructed to indicate which face was more attractive and to also indicate the strength of this preference by choosing from the options 'slightly more attractive', 'somewhat more attractive', 'more attractive', and 'much more attractive'. Trial order and the side of the screen on which any particular image was shown were fully randomised. Each pair of images remained onscreen until the participant had made their response. This paradigm has been used to assess face preferences in many previous studies (see e.g. DeBruine, Jones, Unger, Little, & Feinberg, 2007; Jones, Perrett *et al.*, 2005; Jones *et al.*, 2006). Each pair of composite faces was presented twice. An equal number of filler trials (i.e. pairs of faces that did not differ in gaze direction) were interspersed among the trials assessing gaze preference (totalling eight trials for the short-term relationship block and eight trials for the long-term relationship block).

The study was run online. Previous studies of face preferences have shown equivalent patterns of results in both online and laboratory studies (e.g. Conway, Jones, DeBruine, & Little, 2008; Jones, Perrett *et al.*, 2005; Jones, DeBruine, Little, Conway *et al.*, 2007; Welling, Jones, & DeBruine, 2008).

Initial processing of data

Following Conway, Jones, DeBruine, and Little (2008), responses on the face preference test were coded using the following 0–7 scale:

- 0 = averted gaze was judged *much more* attractive than direct gaze
- 1 = averted gaze was judged *more* attractive than direct gaze

- 2 = averted gaze was judged *somewhat more* attractive than direct gaze
- 3 = averted gaze was judged *slightly more* attractive than direct gaze
- 4 = direct gaze was judged *slightly more* attractive than averted gaze
- 5 = direct gaze was judged *somewhat more* attractive than averted gaze
- 6 = direct gaze was judged *more* attractive than averted gaze
- 7 = direct gaze was judged *much more* attractive than averted gaze

The average strengths of preference for direct gaze when judging feminine male faces for a short-term relationship, masculine male faces for a short-term relationship, feminine male faces for a long-term relationship and masculine male faces for a long-term relationship were then calculated separately for each participant. Although these variables were roughly normally distributed, Kolomgorov-Smirnov tests showed deviations from normality for some variables. However, many researchers have noted that ANOVA is robust to such deviations from normality (e.g. Howell, 2006). Consequently, we used ANOVA for our analyses.

Results

Main analysis

Responses were initially analysed using a mixed-design ANOVA [within-subjects factors: *relationship context* (short-term, long-term), *facial sexual dimorphism* (feminine, masculine); between-subjects factors: *partnership status*: (partnered, unpartnered)]. There was a significant main effect of *facial sexual dimorphism* ($F(1,447) = 4.36$, $p = .037$), whereby women generally showed stronger preferences for direct gaze from feminine men ($M = 4.22$, $SEM = 0.05$) than from masculine men ($M = 4.10$, $SEM = 0.05$). There was also a significant main effect of *relationship context* ($F(1,447) = 11.65$, $p < .001$), whereby women generally showed stronger preferences for direct gaze when judging men's attractiveness as long-term partners ($M = 4.26$, $SEM = 0.05$) than as short-term partners ($M = 4.06$, $SEM = 0.06$). This latter main effect was qualified by a significant interaction between *relationship context*, and *partnership status* ($F(1,447) = 4.12$, $p = .043$), whereby the effect of relationship context was greater for unpartnered women than for partnered women. However, all of these effects were qualified by a significant three-way interaction between *relationship context*, *facial sexual dimorphism* and *partnership status* ($F(1,447) = 3.82$, $p = .050$). Repeating this ANOVA with *order* (short-term judgments first, long-term judgments first) included as a between-subjects factor did not alter our findings. Next, we analysed responses from partnered and unpartnered women separately to interpret the significant three-way interaction between *relationship context*, *facial sexual dimorphism* and *partnership status*.

Women without partners

A 2×2 repeated measures ANOVA [within-subjects factors: *relationship context* (short-term, long-term), *facial sexual dimorphism* (feminine, masculine)] was used to compare the strength of preferences for direct gaze among the four conditions for women who reported that they did not currently have a partner. This analysis of unpartnered women's responses revealed a significant main effect of *relationship context* ($F(1,255) = 16.36$, $p < .001$) and a significant main effect of *facial sexual dimorphism* ($F(1,255) = 5.02$, $p = .026$). The significant main effect of *relationship*

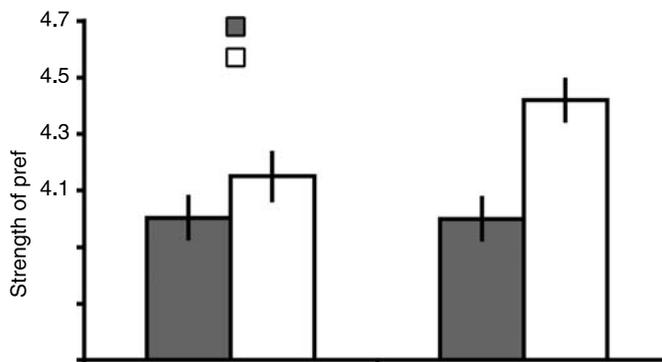
context reflected stronger preferences for direct gaze when judging men as long-term than short-term partners (see Figure 2). The significant main effect of *facial sexual dimorphism* reflected stronger preferences for direct gaze from feminine faces than masculine faces (see Figure 2). Both these main effects were qualified by the predicted significant interaction between *relationship context* and *facial sexual dimorphism* ($F(1,255) = 5.03, p = .026$, see Figure 2). Repeating this ANOVA with *order* (short-term judgments first, long-term judgments first) included as a between-subjects factor did not alter our findings.

To interpret the two-way interaction described above for women without partners, we carried out planned comparisons using paired samples *t* tests. Unpartnered women demonstrated stronger preferences for direct gaze in feminine than masculine faces when judging men's attractiveness as hypothetical long-term partners ($t(255) = 3.27, p < .001$), but not when judging men's attractiveness as hypothetical short-term partners ($t(255) = -0.45, p = .96$). Furthermore, women without partners demonstrated stronger preferences for direct gaze when judging feminine men's attractiveness for long-term relationships than short-term relationships ($t(255) = 4.59, p < .001$), but not when judging the attractiveness of masculine men for long-term relationships versus short-term relationships ($t(255) = 1.57, p = .12$).

One-sample *t* tests comparing the strength of unpartnered women's preferences for direct gaze with what would be expected by chance alone (i.e. 3.5) showed that unpartnered women preferred direct gaze to averted gaze in each of the four conditions (all $t(255) > 6.1$, all $p < .001$).

Women with partners

Responses from women with partners were analysed in the same way as those for women without partners. The repeated measures ANOVA revealed no significant effects (all $F < 1.0$, all $p > .33$). One-sample *t* tests comparing the strength of partnered women's preferences for direct gaze with what would be expected by chance alone (i.e. 3.5) showed that partnered women preferred direct gaze to averted gaze in each of



the four conditions (all $t(192) > 6.0$, all $p < .001$). Repeating the ANOVA with *order* (short-term judgments first, long-term judgments first) included as a between-subjects factor did not alter our findings.

Discussion

Although women generally preferred direct to averted gaze in men's faces in all conditions (see also Conway, Jones, DeBruine, & Little, 2008), the temporal context of the relationship sought, the level of sexual dimorphism displayed in the faces and women's own partnership status modulated the strength of this preference for direct gaze. Women who were not currently in a romantic relationship (i.e. unpartnered women) demonstrated stronger preferences for direct gaze (i.e. social interest, Jones *et al.*, 2006; Conway, Jones, DeBruine, & Little, 2008; Conway, Jones, DeBruine, Little, Hay *et al.*, 2008; Kampe *et al.*, 2001) from feminine men than from relatively masculine men when judging men's attractiveness for long-term relationships, but not when judging men's attractiveness for short-term relationships. Furthermore, unpartnered women's preferences for direct gaze from feminine men were stronger for long-term than short-term relationships, but there was no comparable effect for masculine men. Little *et al.* (2002) have previously shown that women demonstrate stronger preferences for feminine men as long-term partners than short-term partners (see also Penton-Voak *et al.*, 2003). That the temporal context of the relationship sought and the level of sexual dimorphism in men's faces modulated women's preferences for direct gaze in our study therefore complements these previous findings for the effect of relationship context on women's masculinity preferences (Little *et al.*, 2002; Penton-Voak *et al.*, 2003). Our findings also extend this previous work by suggesting that these factors (relationship context, sexual dimorphism) modulate women's preferences for direct gaze in men's faces and that this modulation occurs among unpartnered, but not partnered, women.

Perceptual bias accounts of face preferences have proposed that face preferences are functionless by-products of the visual recognition system (e.g. Enquist, Ghirlanda, Lundqvist, & Wachtmeister, 2002; Winkielman, Halberstadt, Fazendeiro, & Catty, 2006). However, context-sensitivity in face preferences has been interpreted as evidence against such perceptual bias accounts (see e.g. Conway, Jones, DeBruine, & Little, 2008; DeBruine, 2005; Little *et al.*, 2002). Our findings demonstrating that unpartnered women's preferences for direct gaze are modulated by both the temporal context of the relationship sought and men's facial sexual dimorphism are therefore difficult to explain solely as functionless by-products of the visual recognition system. Direct gaze signals social interest in the viewer (see, e.g. Adams & Kleck, 2003; Conway, Jones, DeBruine, & Little, 2008; Jones *et al.*, 2006; Jones, DeBruine, Little, Burriss, & Feinberg, 2007) and preferences for direct gaze may reflect adaptations for efficient allocation of mating effort (Conway, Jones, DeBruine, & Little, 2008; Jones *et al.*, 2006; Jones, DeBruine, Little, Burriss *et al.*, 2007). Moreover, pro-social traits associated with male femininity are thought to be more important for long-term relationships than short-term relationships (see Little *et al.*, 2002; Penton-Voak *et al.*, 2003). Consequently, greater preferences for direct gaze when unpartnered women judge feminine men's attractiveness as possible long-term partners than short-term partners may occur because it is adaptive for unpartnered women to allocate their mating effort primarily to feminine potential long-term partners who appear likely to reciprocate this effort. Thus, our findings for context sensitivity in preferences for social interest from feminine men

suggest that gaze preferences function, at least in part, to enhance the possible benefits to women of their mate choices. Although this interpretation assumes that direct gaze from faces with neutral expressions signals positive social interest, findings from previous studies on attraction to direct gaze suggest that this assumption is warranted. Mason *et al.* (2005) have previously reported an opposite-sex bias in preferences for direct gaze from faces with neutral expressions. Conway, Jones, DeBruine, and Little (2008) reported a similar opposite-sex bias for judgements of faces with smiling expressions, but not for judgements of faces with disgusted expressions. Thus, previous studies have shown that preferences for direct gaze from neutral and smiling faces show the same pattern of results, and have also shown that this pattern of results is different to that seen for faces with disgusted expressions. Collectively, these findings therefore suggest that direct gaze from faces with neutral expressions is more likely to be perceived as positive social interest than negative social interest.

Our prediction that women may show stronger preferences for direct gaze when judging masculine men's attractiveness for short-term than long-term relationships was not supported in either the partnered or unpartnered women that we tested. Previous studies have found that men are more willing to accept offers of short-term relationships from women than offers of long-term relationships (Clark & Hatfield, 1998). Consequently, cues of social interest may be less important when women are assessing men's attractiveness as possible short-term partners than when women are assessing men's attractiveness as possible long-term partners. If so, this may explain why we found no effect of relationship context on women's preferences for direct gaze from masculine men. Consistent with this interpretation, the significant main effect of relationship context that we observed in our study suggests that women do value direct gaze more when judging men's attractiveness as possible long-term partners than when judging men's attractiveness as possible short-term partners. The absence of effects of relationship context and sexually dimorphic facial cues on preferences for direct gaze among partnered women was also unexpected. With regard to this issue, it is, perhaps, noteworthy that the effects of sexually dimorphic facial cues on preferences for direct gaze among unpartnered women appears to be driven by increased preferences for social attention from potential long-term partners who are feminine (see Figure 2). Partnered women might not be expected to show such effects if they are committed to their current romantic partner and are not currently seeking a long-term partner (see also Little *et al.*, 2002). Further research considering individual differences in partnered women's commitment to their partners may clarify this issue.

Our findings add to a growing body of behavioural (Conway, Jones, DeBruine, & Little, 2008; Conway, Jones, DeBruine, Little, Hay *et al.*, 2008; Jones *et al.*, 2006; Mason *et al.*, 2005) and neurobiological evidence (Kampe *et al.*, 2001; O'Doherty *et al.*, 2003) suggesting that cues of social interest interact with physical cues of attractiveness to determine how rewarding viewers consider face images. Our findings add to these findings by suggesting that the temporal context of the relationship sought and current partnership status further qualify these interactions. More research is needed to investigate whether these effects generalise to judgements of the attractiveness of individuals during real-life social interactions, however. An additional limitation of our study is that we only investigated preferences for direct gaze in men's faces and did not include trials assessing gaze preference for women's faces. On this point, it is important to note that several previous studies of gaze preferences have found that preferences for direct gaze are significantly stronger when judging opposite-sex faces than when judging own-sex faces (Conway, Jones, DeBruine, & Little, 2008; Mason *et al.*, 2005; see

also Jones, Feinberg, DeBruine, Little, & Vukovic, 2008 for an equivalent opposite-sex bias in voice preferences), although such opposite-sex biases were not evident in some other studies (Jones *et al.*, 2006; Conway, Jones, DeBruine, Little, Hay *et al.*, 2008). The findings from our current study and from studies showing opposite-sex biases in preferences for cues of social interest are consistent with the view that gaze preferences function, at least in part, to promote efficient allocation of mating effort, above and beyond promoting efficient allocation of social effort more generally (Conway, Jones, DeBruine, & Little, 2008).

That the strength of unpartnered women's preferences for direct gaze in men's faces is modulated by both the masculinity of the men's faces judged and the temporal context of the relationship sought, and that comparable effects were not evident among partnered women, highlights the complex integrative processes that underpin face preferences. Furthermore, our findings are novel converging evidence that these integrative processes may reflect facultative responses that maximise the possible benefits to women of their mate choices.

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