A wedding ring, however, is indicative only of partnership status and provides no information about partner value or partner attitude (Jones, DeBruine, Little, Burriss, & Feinberg, 2007). Jones et al. (2007) have shown that the valence of attitude is an important determinate of whether female attention increases male attractiveness. They found that observing other women with smiling (i.e., positive) expressions who were looking at male faces increased female observers' preferences for those men to a greater extent than did observing women with neutral (i.e., relatively negative) expressions looking at such faces. Women then do appear to mimic the attitude of other women to specific men.

Alongside valence of attitude, the traits of the observed "chooser" may also play a role in social transmission. For example, the mate choice of older (more experienced) female guppies is copied more than the mate choice of younger female guppies (Dugatkin & Godin 1993). If attractive individuals are better able7(the)34.435.31than or

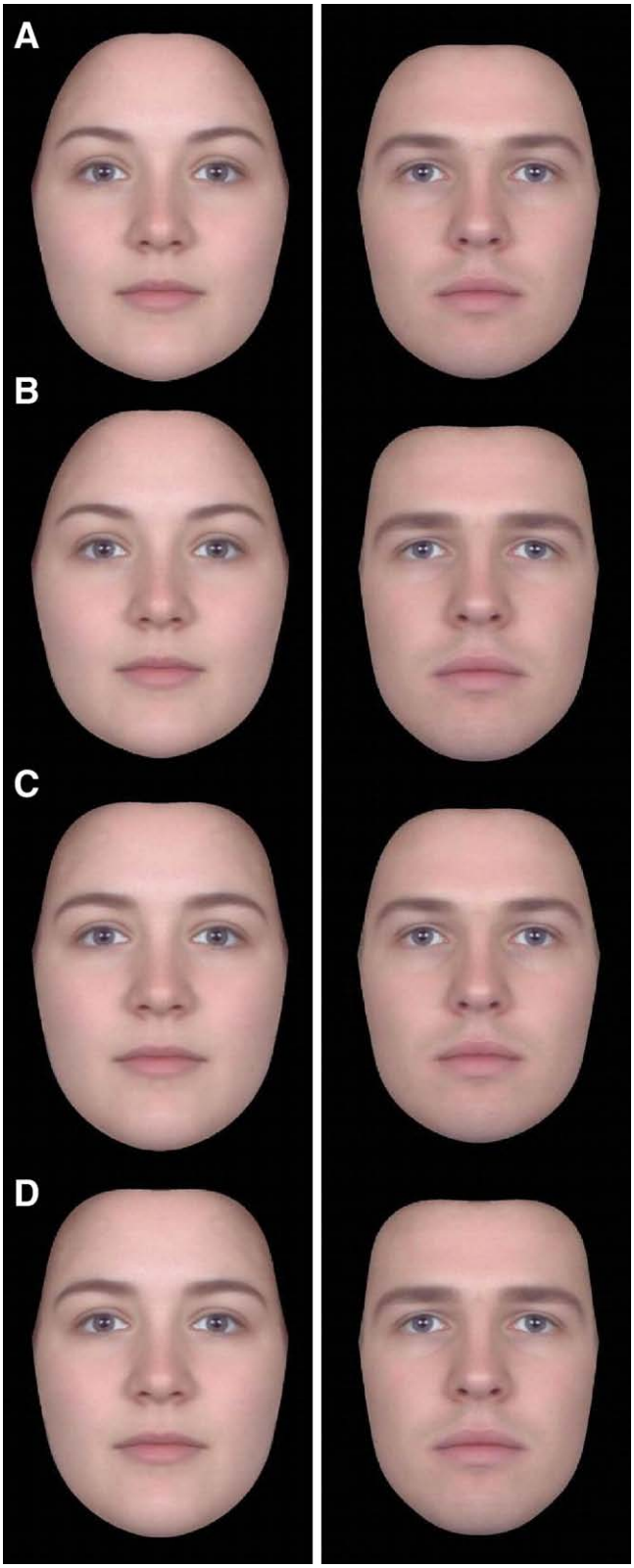

Fig. 1. Example face pairs shown to male participants—feminine female/feminine male (A), feminine female/masculine male (B), masculine female/feminine male (C), masculine female/masculine male (A). Female participants saw the same pairs but with male faces on the left.

Stimuli were composite images of male and female faces. Original images were 50 young adult male and 50 young adult female photographs taken under standard lighting conditions and with a neutral expression. Twenty-five images of each sex were randomly allocated to five sets per sex (five images in each set). From each set of images, a single composite face was produced, giving five male and five female composites. The composite faces were created using specially designed software. Key locations (174 points) were manually marked around the main features (e.g., points outline, eyes, nose, and mouth) and the outline of each face (e.g., jaw line, hair line). The average location of each point in the five faces in each set was then calculated. The features of the individual faces were then morphed to the relevant average shape before superimposing the images to produce a photographic quality result. All images were standardized on interpupillary distance and made perfectly symmetrical by averaging each image with its horizontally flipped version prior to transformation.

Each face was transformed on a sexual dimorphism dimension using the linear difference between a composite of all 50 males and all 50 females following the technique reported in Perrett et al. (1998). Using the shape difference between male and female, the vector of sexual dimorphism can be parameterized allowing manipulation along the vector, described here as a percentage of the distance between male and female. Transforms represented 50% plus or minus the difference between these two composites. Transformations resulted in two images for each base face: one a masculinized version and the other a feminized version. Examples of transformed images can be seen in Fig. 1.

2.3. Procedure

Participants were first presented with a short online questionnaire assessing their age, sex, and sexuality. Participants were then presented with paired images and were asked to rate the attractiveness of opposite-sex faces only. Each target face (male for women and female for men) was presented on the left hand side of the screen for rating. Each target face was presented once in a masculinized and once in a feminized form. Each face was also presented alongside an opposite-sex face (paired face) that was either masculinized or feminized. Participants were asked to rate only images on the left for attractiveness using a 7-point scale (1=low attractive, 7=high attractive). Under the rating instruction, participants were told that the faces on the right were the partners of the people on the left. Images were presented in a random order, and rating the face on the scale moved onto the next trial. Participants were asked to rate the faces for attractiveness under two conditions: as a long-term partner or as a short-term partner. Order of condition was randomized.

Definitions of term were presented prior to rating following previous studies (Little et al., 2007). Long term 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)." Short term 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."

3. Results

All tests are presented two tailed. ηp^2 denotes partial Eta^2.

3.1. Women

A repeated measures analysis of variance (ANOVA) was carried out with "male masculinity" (masculine/feminine), "paired female masculinity" (masculine/feminine), and "term" (short/long) as within-participant factors. This revealed a significant effect of term ($F_{1,50}$=18.92, p<.001, η_p^2=0.989), a significant effect of target male masculinity ($F_{1,50}$=13.56, p<.001, η_p^2=0.951), and a significant interaction between paired female masculinity and term ($F_{1,50}$=4.35, p=.042, η_p^2=0.534). Other effects and interactions were not significant (all $F_{1,50}$<2.19, p>.145, η_p^2<0.306). Women rated the men as less attractive for short- than long-term decisions (short-term=2.12, long-term=2.46) and masculine men as more attractive than feminine men (masculine=2.41, feminine=2.18). The interaction reflected that women were only influenced by the pictured women for long-term decisions (described further below). Mean rating scores can be seen in Fig. 2. Rerunning the ANOVA with the order of rating (long-term first/short-term first) as a between-participants factor revealed no significant effect or interactions with the order (all $F_{1,49}$<2.04, p>.159, η_p^2<0.288).

Using only those responses made by women in the long-term condition, a repeated measures ANOVA was carried out with "male masculinity" (masculine/feminine) and "paired female masculinity" (masculine/feminine) as within-participant factors. This revealed a significant effect of target male masculinity ($F_{1,50}$=6.07, p=.017, η_p^2=0.676), a significant effect of paired female masculinity ($F_{1,50}$=6.35, p=.015, η_p^2=0.695), and no interaction between the two variables ($F_{1,50}$=1.38, p=.246, η_p^2=0.210). Masculine male faces were rated as more attractive than feminine male faces, and men paired with feminine female faces were rated more highly than men paired with masculine female faces.

For short-term decisions in women, a repeated measures ANOVA with factors defined as above revealed a significant effect of target male masculinity ($F_{1,50}$=13.23, p=.001, η_p^2=0.946), no significant effect of paired female masculinity ($F_{1,50}$=0.38, p=.541, η_p^2=0.093), and no interaction between the two variables ($F_{1,50}$=0.71, p=.404, η_p^2=0.131). Masculine male faces were rated as more attractive than feminine male faces, but men paired with feminine female faces were not rated more highly than men paired with masculine female faces.

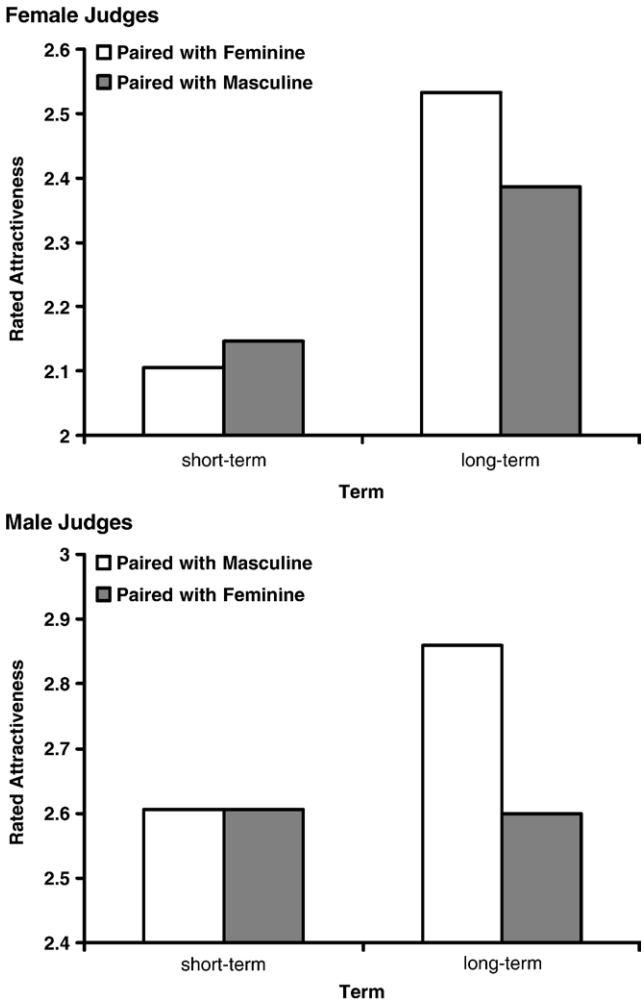

Fig. 2. Ratings of attractiveness for the target faces by female (top) and male (bottom) judges. Scores are split by term and the masculinity of the opposite-sex face paired with it (feminine/masculine). The scale is the same between graphs, but the range changes.

3.2. Men

A repeated measures ANOVA was carried out with "female masculinity" (masculine/feminine), "paired male masculinity" (masculine/feminine), and "term" (short/long) as within-participant factors. This revealed a significant effect of target female masculinity ($F_{1,34}$=18.36, p<.001, η_p^2=0.986), a significant effect of paired male masculinity ($F_{1,34}$=10.89, p=.002, η_p^2=0.894), and a significant interaction between paired male masculinity and term ($F_{1,34}$=5.24, p=.028, η_p^2=0.604). Other effects and interactions were not significant (all $F_{1,34}$<1.69, p>.203, η_p^2<0.243). Men rated feminine women as more attractive than masculine women

(masculine=2.51, feminine=2.82) and, overall, found female faces more attractive when paired with a masculine man. The interaction reflected that men were only influenced by the paired males for long-term decisions (followed up below). Mean rating scores can be seen in Fig. 2. Rerunning the ANOVA with order of rating (long-term first/short-term first) revealed no significant effects or interactions with order (all $F_{1,33}<2.41$, $p>.130$, $\eta_p^2<0.326$).

For long-term decisions in men, a repeated measures ANOVA was carried out with "female masculinity" (masculine/feminine) and "paired male masculinity" (masculine/feminine) as within-participant factors. This revealed a significant effect of target female masculinity ($F_{1,34}=9.93$, $p=.003$, $\eta_p^2=0.864$), a significant effect of paired male masculinity ($F_{1,34}=17.63$, $p<.001$, $\eta_p^2=0.983$), and no interaction between the two variables ($F_{1,34}=0.08$, $p=.773$, $\eta_p^2=0.059$). Feminine female faces were rated as more attractive than masculine female faces, and women paired with masculine male faces were rated more highly than women paired with feminine male faces.

For short-term decisions in men, a repeated measures ANOVA as above revealed a significant effect of target female masculinity ($F_{1,34}=16.49$, $p<.001$, $\eta_p^2=0.976$), no significant effect of paired male masculinity ($F_{1,34}=0.00$, $p=1.00$, $\eta_p^2=0.050$), and no interaction between the two variables ($F_{1,34}=0.15$, $p=.698$, $\eta_p^2=0.067$). Feminine female faces were rated as more attractive than masculine female faces, but women paired with masculine male faces were not rated more highly than women paired with feminine male faces.

3.3. Men and women

We tested to see if the effect of paired face was different between men and women judges. For comparison, because masculinity was seen as attractive in male faces and femininity attractive in female faces, data represented relevant sex preferred and sex nonpreferred pairings (masculine for men and feminine for women vs. feminine for men and masculine for women). We repeated only the long-term ANOVA because no significant effect was seen for short-term judgments and added "sex of judge" (men/women) as a between-participant factor. This analysis again revealed a significant effect of masculinity of the target face ($F_{1,84}=15.32$, $p<.001$, $\eta_p^2=0.972$) and of the paired face ($F_{1,84}=21.89$, $p<.001$, $\eta_p^2=0.996$). Sex of judge did not significantly interact with paired face masculinity ($F_{1,84}=1.68$, $p=.199$, $\eta_p^2=0.249$) and did not have a significant main effect or significantly interact with any of the other factors (all $F_{1,84}<1.97$, $p>.164$, $\eta_p^2<0.284$).

4. Discussion

The data presented here demonstrate that both men and women are influenced in their attractiveness judgments by the attractiveness of a target's partner for long-term decisions but not for short-term decisions. Observers moderate their preferences for specific individuals by using information about the attractiveness of that person's partner. The effect is not strictly copying in this case because all images are presented as partnered, but does show humans use information on others' choices in guiding their own judgments. Our data are then in line with previous studies of social transmission of preference (Jones et al., 2007). We found no significant effect of target attractiveness (whether the face paired with a fictitious partner was masculine or feminine) on the copying-like effect, suggesting that transmission of preference influences both attractive and unattractive targets equally. Although potentially, there could be contrast effects in judgments of attractiveness, with, for example, pairing of a feminine face to a target making the target appear more masculine, the finding that attractiveness judgments changed only for long-term decisions suggests this basic mechanism cannot account for the current data. The copying-like effects here depended on individuals following the choices of attractive over unattractive individuals. This is a more sophisticated form of copying than simply being attracted to those who have vs. those who do not have partners. Indeed, for humans, where only a few individuals remain unpartnered throughout their lives, copying of mate-choice that does not take account of partner quality appears unlikely to be a useful mechanism for identifying high-quality partners. Previous studies have shown that being partnered in the absence of other information is not sufficient to generate copying-like behavior (Uller & Johansson 2003). We did not find a sex-difference in the copying-like effect, and although men may have been expected to copy less as they are more influenced by physical attractiveness when choosing a partner, this finding is in line with studies demonstrating that both men and women highly value positive personality traits in long-term partners (Buss & Schmitt 1993).

Mate-choice copying has been proposed to be adaptive when there is a cost, such as energy, to evaluating the quality of potential mates or when discriminating between the quality of potential mates is difficult (Wade & Pruett-Jones 1990). In this way, social transmission may allow individuals to assess a potential mate quickly and efficiently, and perhaps teaches individuals what to look for in a mate. In humans, there are many aspects to a partner other than their physical traits, and potentially, the choices of others can be used to infer positive or negative traits, such as behavior, resources, or intelligence, which are difficult to infer just from physical appearance.

Specificity to long-term preferences implies that social influence is being used to determine nonphysical traits that make a target a good long-term partner. Studies have shown that individuals value physical attractiveness in short-term contexts over other attractive traits such as pleasant personalities (Buss & Schmitt 1993). Judges may then be able to acquire the physical information from a photograph to judge physical attractiveness for short-term contexts, and hence, the extra information from the paired partner is of

little relevance. Humans bring two factors to a parenting relationship: a level of parental investment and potential heritable benefits (e.g., genes for high-quality immune systems). Social information may be more useful for judging the former given such information is less readily discernable. Of course, in species without parental care, mate-choice copying likely occurs because individuals are able to acquire information about the genetic quality of a prospective mate (Witte & Ryan 2002), and potentially, this is also true in humans despite our finding of specificity to long-term judgments.

It is important to note that there may be other issues here. We presented our targets as partnered, and individuals may, consciously or unconsciously, assume that when judging attractiveness for long-term relationships, the target would be leaving their current partner, whereas short-term judgments may imply targets would be cheating on their partner but remaining with them in the long-term. Judges may have taken into account potential retaliation of the current partner (though this is also an issue for the long-term condition) or that individuals with attractive partners may have less reason or desire to cheat (Gangestad, Thornhill, & Garver, 2005). Factors such as these may then also detract from using social information in short-term contexts.

An effect in humans influencing long- but not short-term decisions is consistent with recent findings in mice. Kavaliers et al. (2006) found that female mice are influenced by the smell of other females in guiding their interest in males, a finding suggestive of mate-choice copying, and that female mice with deletions of the oxytocin (OT) gene do not show this effect. This finding suggests that OT appears to mediate mate-choice copying-like effects, at least in mice. Given OT's role in pair bonding (Ferguson, Aldag, Insel, & Young, 2001; Pedersen & Boccia 2002), it is possible that mice with intact OT genes were more interested in pair bonding and show preferences more akin to a long-term mating decision for humans.

Models of mate-choice have suggested that social transmission of mate preferences can contribute to sexual selection for male traits (Brown & Fawcett 2005; Galef & Laland 2005; Kirkpatrick & Dugatkin 1994; Laland 1994). Potentially, our study adds a caveat to some assumptions in these models—individuals may select their long-term partners based on copying-like behavior, but because their short-term decisions remain less affected, the potential for copying to lead to rapid spread in certain genes may be more complicated.

In summary, the studies presented here extend work on the social transmission of mate preference in humans, demonstrating that both men and women use information about the attractiveness of a partner to inform their long-term but not their short-term preferences. Although our experiment is somewhat unnatural, we note that face preferences have been found to correlate with perceived partner characteristics (DeBruine et al., 2006), which suggests that findings from preference studies might reflect choices outside of the laboratory. An effect akin to mate-choice copying in humans may then partly determine selection of long-term partners, whereas other physical factors determine short-term choices.

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