



Viewing attractive or unattractive same-sex individuals changes self-rated attractiveness and face preferences in women

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Condition-dependent mate choice in females, whereby condition or attractiveness influences preferences for markers of male quality, is seen in both fish and humans. Such effects may be explained by (1) genetic linkage between trait and preference, (2) poor-condition females having energetic constraints limiting their choosiness, and (3) females of low mate value benefiting from avoiding high-quality males, based on the differential behaviour of high-quality males towards mates of low and high value. We used a contrast effect in women, showing attractive and unattractive same-sex individuals to induce a change in self-rated attractiveness as seen in previous studies, to test the validity of the last explanation. The first two explanations predict that preferences should remain constant across manipulations of self-perceptions of attractiveness, whereas the last predicts preferences should change in line with an individual's perceived mate value. Exposure to attractive same-sex images resulted in lower self-rated attractiveness and preferences for male facial masculinity, whereas exposure to unattractive images resulted in higher self-rated attractiveness and preferences for masculinity. As facial masculinity may be an attractive trait, these results imply that, at least in humans, condition-dependent mate choice may be better conceived as 'market-value-dependent mate choice'.

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Evolutionary approaches to human attractiveness have documented several traits that are proposed to be attractive across individuals and cultures, potentially reflecting species-wide 'universal' preferences. These include preferences for facial traits such as masculinity and symmetry (Thornhill & Gangestad 1999). Around such general preferences studies and reviews have pointed to how evolutionary theory can also be consistent with individual differences in preferences (Little et al. 2001, 2002a,b,c; Little & Perrett 2002).

One potential source of individual differences in partner choice is the quality or attractiveness of an individual's phenotype. Condition affects preferences in several fish species. Females in poorer condition show no preferences for good-gene markers in the form of coloration in the guppy, *Poecilia reticulata*, (Lopez 1999), and in sticklebacks, *Gasterosteus aculeatus*, females in poor condition prefer males without such markers to males that do possess them (Bakker et al. 1999). Further evidence also comes

from sticklebacks, where females in poor condition do not show as a strong preference for symmetry as those in better condition (Mazzi et al. 2003). In humans, Little et al. (2001) found analogous results showing that women who thought they were physically attractive preferred more masculine faces and had greater preferences for symmetry than those women who thought they were less physically attractive. Such condition-dependent choice for facial masculinity in women has also been shown for actual cues of attractiveness, such as facial attractiveness rated by other people and measured waist-to-hip ratio (Penton-Voak et al. 2003).

While condition and attractiveness impact on preferences in both fish and human studies, the mechanism by which this occurs is unclear. We briefly consider three explanations covering different levels of biology (genetic, energetic and behavioural), although the focus of this paper is in testing the validity of the behavioural explanation. One possible genetic explanation for condition-dependent mate choice is that the daughters of males who lack good-gene markers do not inherit a preference for such markers because both the genes that develop the markers in males and those that determine the preference in females are closely linked on the genome. In this way daughters of high-quality fathers inherit, and daughters of

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low-quality females do not inherit, both types of gene, as well as the condition of their fathers, linking condition and preference (Bakker et al. 1999). Thus heritable condition can determine preferences because of a classic assumption of Fisherian models of sexual selection: linkage between genes for advertising traits and genes for the preferences for such traits (Fisher 1930).

Energetic costs may also influence condition-dependent mate choice. Lopez's (1999) studies of guppies, comparing the preferences of parasitized and unparasitized females, showed that, as well as the decreased discrimination, activity during choice trials decreased with increasing parasite load implying that perhaps such females are unable to engage in energetically costly choice. In general, low-quality females may be expected to be most parasitized or least likely to have energy to spare for mate choice and so an energetic cost to choice is a plausible explanation for condition-dependent preferences. Individuals in poor condition may be unable to be choosy because of physiological costs involved in making choices.

The third explanation for condition-dependent mate choice invoked here involves a behavioural response to one's own condition or attractiveness, as condition influences competitiveness for mates and thus impacts on mating strategy. For humans, the absence of a preference for proposed markers of good genes has been interpreted as potentially adaptive for women of low mate value to avoid the costs of decreased parental investment/potential desertion from high-quality partners (Little et al. 2001). Such reasoning arises from notions that high-quality males are least likely to invest in or even desert their partners (Gangestad & Simpson 2000). High-quality females are most likely to be able to extract investment from high-quality partners. In this way the mate value of a woman may determine her preferences for quality because females of different mate values may have differing costs and benefits of mating with high-quality males.

How these three explanations relate to condition-dependent mate choice can be examined via the flexibility of such effects. Condition, quality or attractiveness are all terms that relate to an individual's mate value or, perhaps more descriptively, market value. 'Market value' in mate choice is useful as it refers to how much demand there is for a particular individual as a mate within a population (Pawlowski & Dunbar 1999). If the relative number of attractive or unattractive individuals within a population, or perceptions of the relative number in a population, changes, we might expect an individual's market value to change in line with his or hers new competition level. The genetic and energetic explanations do not relate to market value, but instead are based on inflexible/unchangeable mechanisms that are tied to inherited genes or absolute condition. The behavioural explanation put forward by Little et al. (2001) on the other hand, is very much linked to notions of the perceived and real market value of an individual and thus open to change in line with population change.

Flexibility in mating strategy according to relative attractiveness has been observed in zebra finches, *Taeniopygia guttata*. Females made attractive with coloured leg rings spent less time carrying out parental duties than

both those typical of their sex and unattractive females but still had higher reproductive success, possibly because mates of attractive females spent more time than those typical of their sex carrying out parental duties (Burley 1986). Female zebra finches thus apparently reacted to their higher attractiveness, adjusting their strategy, and this change in attractiveness also induced their partners to behave differently.

For behaviour to change in this way an individual must be attentive to cues to the number of other attractive and unattractive individuals around them. Humans do appear sensitive to information about the relative attractiveness of both potential mates and themselves within a population. Perceptions of physical attractiveness are subject to a perceptual contrast effect. Individuals adjust their judgements of attractiveness according to whether the target person is presented alongside a more attractive one (Geiselman et al. 1984; Wedell et al. 1987) or are exposed to photographs of attractive individuals before rating the target images (Kenrick & Gutierrez 1980; Kenrick et al. 1989). Under both of these conditions experience of attractive individuals decreases the attractiveness of others. Self-ratings of attractiveness also appear subject to an attractiveness contrast effect. Exposure to others who are more physically attractive generally decreases self-ratings of attractiveness, whereas exposure to less attractiveness can result in an increase in self-rated attractiveness (Kenrick & Gutierrez 1980; Cash et al. 1983; Brown et al. 1992; Thornton & Moore 1993). Exposure to attractive or unattractive opposite-sex others has effects extending beyond attractiveness judgements and one study shows that such exposure to attractive females can lead males to discount future rewards in favour of short-term rewards (Wilson & Daly 2004).

We investigated the mechanism for condition-dependent mate choice in human females, by examining the behavioural mate value hypothesis. Building on the studies on zebra finches and humans implying flexibility in self-opinion, we examined contrast effects of exposure to attractive and unattractive same-sex individuals, which are likely to impact on self-perceptions of mate value. We also examined whether such changes in self-opinion can then subsequently influence preferences for a specific facial trait in opposite-sex faces. Genetic and energetic explanations of condition-dependent mate choice would predict preferences to be unaffected by such manipulations of self-estimated value, as they relate to unchangeable factors. If own-sex comparison does impact on opposite-sex preferences then this would be strong evidence that the flexible mate value account of condition-dependent choice is a plausible mechanism for humans, although does not rule out the other explanations as contributing factors. While previous studies have put forward mate value explanations for condition-dependent effects (e.g. Little et al. 2001) this is the first to our knowledge to test directly the mate value account.

Although the relation between sexual dimorphism in face shape and gene quality remains to be determined, we used sexual dimorphism in human male faces as a proxy for quality as it is a proposed marker of genetic quality (Thornhill & Gangestad 1999), associated with costs and

benefits to the chooser (Perrett et al. 1998) and has shown reliable condition-dependent effects in humans (Little et al. 2001; Penton-Voak et al. 2003). We used attractiveness as a measure of condition and mate value. While linking attractiveness to mate value is uncontroversial, in humans the link between attractiveness and health is a debated topic (Shackelford & Larsen 1999), although some studies show that face traits that are associated with attractiveness are related to health (Rhodes et al. 2001) and that attractiveness is related to longevity (Henderson & Anglin 2003).

METHODS

Participants

We studied 65 heterosexual human females (aged 16–45, $\bar{X} \pm SD = 23.5 \pm 5.6$ years) who were students at the University of Liverpool.

Attractive and Unattractive Stimuli

Following Wilson & Daly (2004), we selected 20 attractive and 20 unattractive photographs of females from a freely accessible online database (<http://www.hotornot.com>). On this site visitors are asked to rate submitted images for attractiveness on a 10-point scale (1 = not attractive; 10 = very attractive), the mean of which is displayed, and each photograph has usually been rated by hundreds of judges. Photographs were selected for relatively high quality and displaying the face prominently, although images also included bodies. The criterion for attractive was a score >9 (mean = 9.7) and that for unattractive was a score <6 (mean = 4.5; while this may appear high for unattractive images the very low scores were usually associated with poor quality/small images and so this mean reflects an attempt to maximize image quality).

Face Preference Stimuli

The faces were 10 pairs of composite male images, one masculinized, one feminized (Fig. 1). The original images were photographs of 50 young adult males taken under standard lighting conditions and with a neutral expression. The composite images were made by creating an average image made up of five randomly assigned individual facial photographs (this technique has been used to create composite images in previous studies, see e.g. Benson & Perrett 1993; Tiddeman et al. 2001; Little & Hancock 2002). Faces were transformed on a sexual dimorphism dimension by using the linear difference between a composite of all 50 males and an equivalent composite of 50 young adult females (following the technique reported in Perrett et al. 1998). Transforms represented $50\% \pm$ the difference between these two composites.

Questionnaires

Self-ratings of facial and body attractiveness were made on a 7-point scale. These two questions were presented

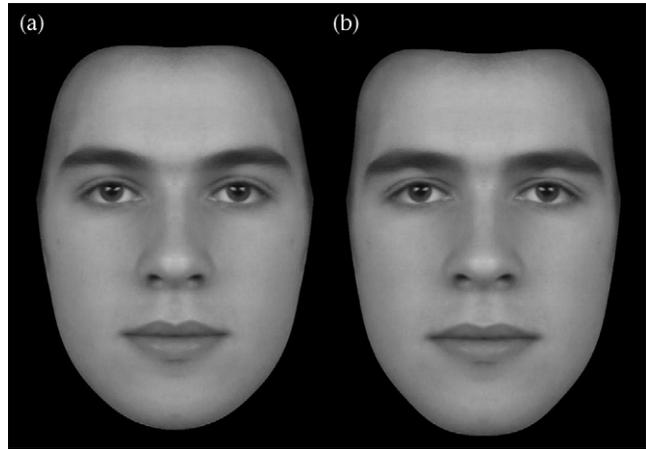


Figure 1. Examples of (a) feminized and (b) masculinized male images.

among several other questions as part of two questionnaires. Questionnaire 1 and questionnaire 2 contained different questions and served to minimize the chances of participants guessing the hypothesis of the study by not simply presenting the questions of interest. The data from the rest of the questionnaires are not analysed here.

Procedure

The experiment was administered online via computer screen. To minimize the chances of participants guessing the manipulation involved in the study, they were told on screen that they would be taking part in two different studies. Participants were first told they were participating in Study 1 and were asked their age and sex at the beginning of the study as well as whether they used oral contraception, had a partner, and how many days it was since their last period, as masculinity preference is known to vary with these factors (Penton-Voak et al. 1999; Little et al. 2001, 2002a). Participants were then administered questionnaire 1, followed by a randomly determined attractiveness condition (attractive, $N = 31$ women, or unattractive, $N = 34$ women). Participants were presented with the 20 exposure faces singly and asked to rate them for physical attractiveness on a 10-point scale. Images were presented in a random order and selecting a number between 1 and 10 took participants to the next trial. At the end of the rating a screen appeared stating that the participant was now beginning Study 2, which would involve another questionnaire, which contained some similar questions, followed by a facial preference test. Participants were asked on screen to complete all the questions and were then presented with questionnaire 2, including duplicate attractiveness questions. After completing questionnaire 2, they saw the 10 pairs of masculine and feminine faces. These were shown as pairs with both order and side of presentation randomized. Participants were asked to choose the face of the pair that they found most attractive and clicking a button underneath the chosen face moved on to the next face trial. Four options were given under each face to assess relative

preferences (guess, slightly more, more, strongly more) giving a score from 0 to 7 (0 = strongly prefer feminine, 7 = strongly prefer masculine). This type of scale has been used in previous studies (Jones et al. 2005).

RESULTS

Initially, we calculated Pearson correlation coefficients to examine the relatedness of self-ratings of facial and body attractiveness not distinguishing the two conditions. This revealed a significant positive correlation ($r_{63} = 0.48$, $P < 0.001$) between the two variables and indicated the utility of maintaining the two measures rather than calculating a combined score, as they are each likely to account for some unique variance. Further correlations revealed strong, significant, positive correlations between pre- and postexposure self-ratings of both facial ($r_{63} = 0.86$, $P < 0.001$) and body ($r_{63} = 0.89$, $P < 0.001$) attractiveness indicating consistency in self-opinion over time.

For comparison between participants in the attractive and unattractive conditions, we calculated a difference score for both self-perceived facial and body attractiveness. This score was: postexposure self-rating minus pre-exposure self-rating. Positive scores indicated an increase in self-ratings and negative scores a decrease in self-ratings. To assess the effects of condition on attractiveness, we conducted ANOVAs with change in self-perceived facial attractiveness and change in self-perceived body attractiveness as dependent variables, condition (attractive or unattractive) as a between-participant factor, and age as a covariate. This revealed significant effects of condition on both change in self-perceived facial attractiveness ($F_{1,62} = 6.2$, $P = 0.015$) and change in self-perceived body attractiveness ($F_{1,62} = 6.3$, $P = 0.014$): both increased after exposure to unattractive images and decreased after exposure to attractive images (Fig. 2a).

An ANOVA with preference for masculinity in male faces as the dependent variable revealed a significant effect of condition on face preference ($F_{1,62} = 5.6$, $P = 0.022$), with those in the unattractive condition preferring masculinity more than those in the attractive condition (Fig. 2b). Age had no significant effects on any of the three dependent variables in the above analyses (all $P > 0.15$).

Masculinity preference was significantly correlated with body attractiveness in the unattractive condition (Pearson correlation: $r_{32} = 0.42$, $P = 0.014$), but not with facial attractiveness ($r_{32} = 0.28$, $P = 0.10$), or with body ($r_{29} = 0.15$, $P = 0.14$) or facial ($r_{29} = 0.15$, $P = 0.41$) attractiveness in the attractive condition. While the groups differed in whether their attractiveness was lowered or raised post condition, positive correlations here indicate that those whose attractiveness was relatively higher post condition had greater preferences for masculinity than those with lower attractiveness.

Although random assignment to condition should mean our samples were equivalent, because masculinity preferences were acquired only after exposure, we tested to see whether participants in the attractive/unattractive conditions differed in self-perceptions pre-exposure. No difference was found in initial self-rated facial attractiveness

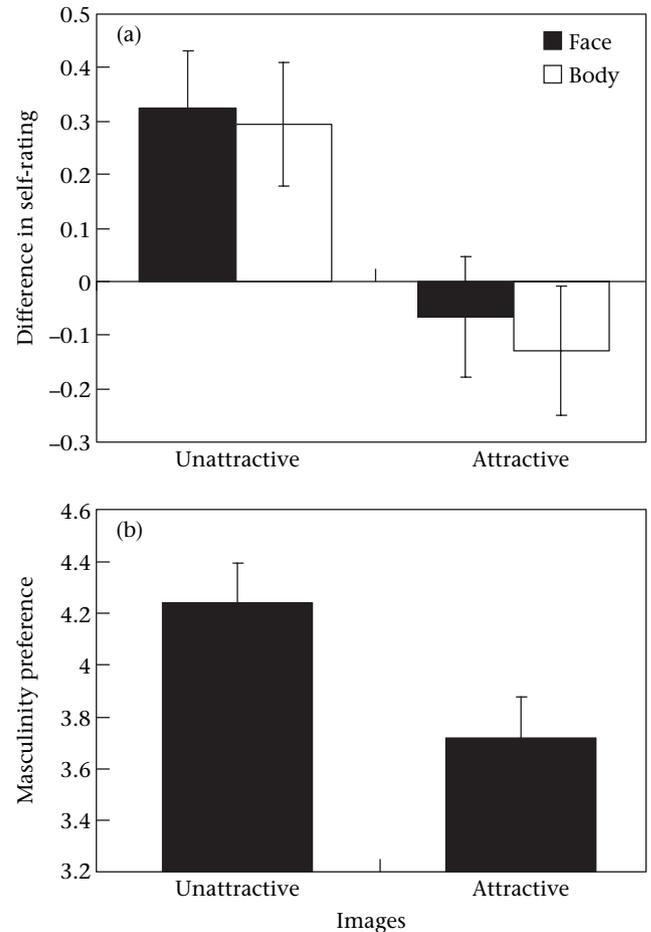


Figure 2. (a) Differences in self-rated face and body attractiveness (positive = increase) and (b) masculinity preferences after exposure to unattractive or attractive same-sex images. Means are shown ± 1 SE.

(independent samples t test: $t_{63} = 1.4$, $P = 0.17$) or body attractiveness ($t_{63} = -0.2$, $P = 0.81$) between participants in the two conditions.

We found no significant difference between women in the two conditions for age (independent samples t test: $t_{63} = -0.1$, $P = 0.96$), oral contraceptive use ($t_{63} = -0.4$, $P = 0.72$), being partnered ($t_{63} = 0.2$, $P = 0.82$) and day of menstrual cycle ($t_{63} = 0.3$, $P = 0.78$).

We also assessed overall preferences for masculinity in the two conditions using one-sample t tests against no preference for masculine or feminine versions (3.5). This revealed a significant preference for masculine versions in the unattractive exposure condition ($t_{33} = 5.0$, $P < 0.001$) and no significant preference for those in the attractive exposure condition ($t_{30} = 1.3$, $P = 0.19$).

DISCUSSION

Our study shows that in human females viewing attractive or unattractive same-sex individuals influences self-perceptions of attractiveness and preferences for sexual dimorphism in male faces. Exposure to attractive others decreased ratings of both face and body attractiveness and

preferences for male facial masculinity. Exposure to unattractive others had the opposite effects, increasing self-ratings of attractiveness and preferences for masculinity. For those exposed to the unattractive group a relation between change in attractiveness and preferences was seen: those whose body attractiveness increased the most after exposure had higher preferences for masculinity than those whose self-opinion changed little.

Previous studies have examined the effect of viewing attractive or unattractive members of the opposite-sex on 'choosiness', showing that those viewing attractive images subsequently rate other people lower than they otherwise would (Kenrick & Guttierres 1980; Geiselman et al. 1984; Wedell et al. 1987; Kenrick et al. 1989). Such exposure can also affect feelings about one's own partner: women are less satisfied with their relationships after exposure to socially dominant men (Kenrick et al. 1994). Studies have also shown contrast effects of viewing attractive or unattractive members of the same sex, whereby those viewing attractive members of the same sex show a decrease in self-esteem about their own attractiveness (Kenrick & Guttierres 1980; Cash et al. 1983; Brown et al. 1992; Thornton & Moore 1993). Our results combine both aspects of these two types of study, showing that viewing attractive or unattractive images of the same sex influences not only self-opinion but also subsequent choosiness in opposite-sex mate choice. Here we also expand notions of choosiness beyond relative increases and decreases in globally rated attractiveness to examining specific attractive, and potentially good-gene advertising, facial traits.

Demonstrating that masculinity preferences can be affected by manipulation of self-rated opinion highlights flexibility in condition-dependent mate choice and is in line with the behavioural, market-value-dependent, explanation put forward by Little et al. (2001). As noted in the Introduction, both genetic and energetic explanations are based on inflexible/unchangeable mechanisms that are tied to inherited genes or absolute condition and thus cannot account for our results, as actual quality/attractiveness did not change. Of course both explanations could operate alongside the behavioural account in driving condition-dependent preferences, but our results show that mechanisms sensitive to one's own market value are important, and possibly sufficient, to explain condition-dependent preferences in humans. At least in terms of energetic costs, our tests are unlikely to show up such effects, and so are unlikely to be explained by such reasoning, given the low energy costs in making attractiveness judgements in our study, although in real world mate choice these factors may be more important.

As relative mate value may be more important than absolute mate value in driving condition-dependent mate choice, this implies that, at least in humans, the phenomenon may be better conceived as 'market-value-dependent mate choice'. Whereas many would argue that measuring actual mate value may be most important in determining preferences, notions of market value and the flexibility in determining one's own value show that an individual female's behaviour is potentially more likely to be dependent on her own estimated value rather than that of

others, as others are not necessarily able to compare the individual to their relevant competitors.

A truly adaptive view of mate choice would predict flexibility in assessing our own physical attractiveness as an individual's attractiveness is only relative to the attractiveness of the pool of competitors with which she has to compete. Women feel they have relatively less control over traits relevant to their desirability than men, potentially because men select partners on the basis of traits that are relatively uncontrollable (e.g. youth, attractiveness, Ben Hamida et al. 1998). If intrasexual competition for mates in females is based on such uncontrollable traits, we might expect them to have sophisticated mechanisms for estimating their relative worth within a population. From our study, human females appear to detect changes in the perceived population of competitors rapidly and this creates a change in self-perception of physical appearance and also mate preference.

In humans, self-esteem may reflect the extent to which an individual believes that he or she is valued as a partner by the opposite sex (Leary & Baumeister 2000). Indeed, individuals who consider themselves to be attractive as partners do indeed have higher levels of self-esteem than those who think themselves less attractive as partners (Brase & Guy 2004). Changing both self-perceptions of attractiveness and mate preferences in line with presented same-sex competitors provides further evidence for a link between perceived mate value and self-esteem.

While self-esteem may be a useful measure in humans, who can state how attractive or unattractive they think they are, the effects shown here need not depend on the ability to form such a concept. Our results are somewhat analogous to Burley's (1986) work on zebra finches, in which female finches changed their behaviour in response to manipulation of their attractiveness. Their behaviour probably changed because of a change in behaviour of males (or even other females) towards them according to their new attractiveness. This implies that female finches have some mechanism that is responsive to their desirability that changes their behaviour accordingly: a mate value monitor that could be construed as self-esteem without having recourse to a self-referential mentalizing ability. The ability to estimate one's own mate value in humans may be reliant on a similar mechanism to which we have conscious access rather than the unique ability to verbalize our self-opinion, which then results in changes in behaviour. The cognitive and motivational mechanisms underlying the monitoring of one's own mate value across different species remains an interesting avenue of research.

Examining the general preferences revealed no overall preferences for either masculinity or femininity in those viewing attractive female images and significant preferences for masculinity in those viewing unattractive female images. While preferences for masculinity in those viewing unattractive female images may conflict with previous findings showing overall preferences for femininity (Perrett et al. 1998; Little et al. 2001; Little & Hancock 2002), in fact our study highlights variability in masculinity preferences as have many previous studies (Little et al. 2001, 2002a,b; Little & Perrett 2002). We used

different composite images to define sexual dimorphism, which may account for some variation in preference. Aside from this, facial sexual dimorphism is a particularly interesting component of mate choice given the potentially adaptive variation both between and within individuals, and studies should be careful to note that such variation may make it difficult to define an average preference for masculinity. Certainly the mixed findings for facial masculinity preferences observed for male faces (Thornhill & Gangestad 1999; Little et al. 2002b) may in part be caused by such variability. Our study shows that visual cues to the traits of same-sex competitors can change preferences very rapidly within individuals, further highlighting the flexibility of mate choice mechanisms in humans.

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