



Variation in facial masculinity and symmetry preferences across the menstrual cycle is moderated by relationship context

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Summary In women, changes in preference during the menstrual cycle have been documented for attractiveness judgements of odour and various physical and behavioural male traits. Although many studies have demonstrated greater attraction to masculine traits, such as male faces, bodies, and voices, at high fertility, several recent studies present null results for these shifts in preferences. Moreover, evidence for stronger attraction to symmetric faces at high fertility is equivocal. Here we examined variation in preferences across the cycle for both facial masculinity and symmetry according to relationship context. Using both within-subject (Study 1) and between-subject (Study 2) designs, we show that women prefer masculinity and symmetry in male faces at times when their fertility is likely to be highest (during the follicular phase of their cycle) when judging the faces for short-term relationship attractiveness. No effect of cycle was seen for long-term judgements. These results indicate that cyclic shifts in women are most apparent when judging for short-term relationships, which may explain the null results in studies where only general attractiveness was assessed. Cyclical preferences could influence women to select a partner who possesses traits that may enhance her offspring's quality at times when conception is most likely and/or serve to improve partner investment when investment is important.

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1. Introduction

Women differ in their face preferences and one biological explanation for within-individual variation lies with hormonal

changes during the menstrual cycle. Many studies have demonstrated that women's preferences for certain male traits change during the menstrual cycle. Increased preferences for facial masculinity (Frost, 1994; Penton-Voak et al., 1999; Penton-Voak and Perrett, 2000; Johnston et al., 2001), vocal masculinity (Puts, 2005; Feinberg et al., 2006), dominant behaviour (Gangestad et al., 2004), the smell of dominant men (Havlicek et al., 2005) and for masculine body shapes (Little et al., 2007b) that coincide with the late follicular (i.e. fertile) menstrual cycle phase have been

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reported. Cyclic shifts are also seen for other mate choice relevant traits whereby fertile women are quicker to categorise men's faces as male (Macrae et al., 2002) and generally rate men as more attractive (Danel and Pawlowski, 2006). Shifts are also seen for face traits such as self-resemblance (DeBruine et al., 2005) and are also evident in increases in pupil diameter when viewing sexually partners during the fertile phase (Laeng and Falkenberg, 2007). Cyclic shifts are thought to reflect the underlying effects of female hormones on preferences for male traits. Several hormones change across the cycle and shifts have been linked to oestrogen (Roney and Simmons, 2008), progesterone (Jones et al., 2005; Puts, 2005), and testosterone (Welling et al., 2007), although such shifts are potentially best explained by complex interactions among multiple hormones (Feinberg et al., 2006; Welling et al., 2007).

Changes in preferences for masculine men are potentially adaptive. Two of the factors that human males bring to a parenting relationship (investment in their partner and offspring, and potential heritable benefits) have been the focus of most research. Masculinity in males has long been thought to be indicator of quality via classic handicap models (Folstad and Karter, 1992); as higher testosterone levels handicap the immune system (Kanda et al., 1996) and therefore only high quality males may be able to afford to be masculine (Thornhill and Gangestad, 1999). The relationship between masculinity and quality is controversial and there are several lines of reason involved in why it might be preferred (Thornhill and Gangestad, 1999; Getty, 2002).

While masculine faced men are healthier (Rhodes et al., 2003; Thornhill and Gangestad, 2006), physically stronger (Fink et al., 2007), and more facially symmetric (Little et al., 2008b) than their feminine faced counterparts, masculinity in a partner also carries a cost. Masculine faced men are found to be more aggressive (Carre and McCormick, 2008) and more likely to pursue short-term relationships than feminine faced men (Boothroyd et al., 2008). Men with masculine faces also have higher circulating testosterone levels (Penton-Voak and Chen, 2004) which are linked to marital instability and lower levels of attachment in relationships (Booth and Dabbs, 1993; Burnham et al., 2003). As might be expected then, masculine faces are seen as more dominant but not seen as possessing traits that would be desirable in a long-term partner (Perrett et al., 1998; Boothroyd et al., 2007). Thus, variation in preferences during the menstrual cycle may enable women to maximize the benefits of their mate preferences, potentially shifting priorities between heritable benefits to offspring, such as health or dominance, and investment (Penton-Voak et al., 1999).

Although peaks in sexual desire and activity have been reported at different stages across the menstrual cycle (Regan, 1996), some studies have reported that women with partners may be more likely to engage in extra-pair sexual activity at peak fertility (Baker and Bellis, 1995). Further evidence for possible extra-pair sexual behaviour comes from studies showing that women at peak fertility are more likely to have sexual fantasies about men other than their primary partner (Gangestad et al., 2002), express a greater interest in attending social gatherings where they might meet men at peak fertility (Haselton and Gangestad, 2006), and report being more committed to their partners during the luteal phase of the menstrual cycle and less committed in the late

follicular phase (Jones et al., 2005). These studies suggest a possible mechanism whereby women may maximize their chances of becoming pregnant with the offspring of males chosen for extra-pair affairs. Such males may be selected for possessing superior or alternative genes to the woman's current partner.

As a different, but potentially complementary, explanation for shifting preferences, alterations in progesterone level have been associated with increased commitment to a partner, and increased preferences for less masculinised male faces during the luteal phase of the cycle (Jones et al., 2005). Similar findings for the link with progesterone are seen for preferences for masculine voices (Puts, 2006). This link with progesterone may reflect an increase in the care and support that is sought during times when a woman's hormonal profile is similar to that characterized in pregnancy (Jones et al., 2005). In this way, rather than acquiring indirect benefits for offspring from masculine men, women may instead maximize investment from feminine men when raised progesterone prepares the body for pregnancy (Jones et al., 2005).

Preferences for masculinity in faces have also been found to be moderated by other factors relating to potentially strategic choice. An increased preference for genetic fitness over signs of parental investment would be expected in extra-pair copulations when a woman has already acquired a long-term partner. Indeed, Little et al. (2002) have shown that women who have partners prefer masculinity in faces more so than females without a current romantic partner. Another factor that influences preferences for facial masculinity is the type of relationship being looked for. Studies have shown that women tend to prefer more masculine faces when judging for a short-term than for a long-term relationship (Little et al., 2002). Indeed, in a variety of studies, cycle effects are often more likely seen when women judge for short-term relations (reviewed in Gangestad and Thornhill, 2008; Jones et al., 2008). In a similar way to already having an investing partner, short-term relations minimise the need to value investment from partners. While studies have focused on male masculinity, symmetry is another putative cue to male health (Thornhill and Gangestad, 2006) and has also been found to vary across the cycle with studies showing both within- and between-subject shifts in preferences towards more symmetric faces at high fertility (Little et al., 2007c). Relationship status and relationship context appear to be important for cyclic shifts in preferences. Cyclic shifts in women's preferences for masculine characteristics in men's faces are generally greatest among women who already have romantic partners and when women judge men's attractiveness for short-term, extra-pair relationships (Penton-Voak et al., 1999; Little et al., 2007c; Gangestad and Thornhill, 2008; Jones et al., 2008). In particular, preferences appear to shift mainly for short-term contexts, when context has been examined, and indeed no study that has distinguished between short- and long-term contexts has shown a cycle shift for long-term judgements (reviewed in Gangestad and Thornhill, 2008; Jones et al., 2008). While there is indeed a growing body of evidence that shifts in preferences for masculine traits do occur across the cycle, some studies have not demonstrated these effects. There have been unsuccessful replications of cyclic variation in women's masculine face preferences. For example, two recent studies observed no evidence for cyclic variations in women's preferences for

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