



## Estimated hormones predict women's mate preferences for dominant personality traits

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### ABSTRACT

Recent studies have reported that women exhibit elevated preferences for behavioral dominance in potential mates on higher fertility days of the menstrual cycle. This study was designed to test which hormonal signals may be associated with such cycle phase shifts in dominance preferences. Women indicated their mate preferences for dominant personality traits, and self-reported cycle day was used to estimate each woman's levels of estrogen, FSH, LH, progesterone, prolactin, and testosterone on her day of testing. Women's preferences for dominance in long-term mates were elevated on cycle days when estrogen is typically elevated, including during the luteal phase when conception is not possible. Preferences for dominance in short-term mates were highest on cycle days when LH and FSH are typically peaking. These findings support the existence of two types of hormone-regulated psychological mechanisms, each of which is proposed by a distinct functional theory of menstrual phase preference shifts: (1) a between-cycle mechanism that increases preferences for dominance in long-term mates during more fertile cycles characterized by higher estrogen, and (2) a within-cycle mechanism that couples enhanced preferences for dominance in short-term mates to the timing of ovulation.

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### 1. Introduction

Accumulating evidence indicates that women express stronger attraction to putative markers of phenotypic quality in men (such as masculinized or symmetrical features) when tested near ovulation than when tested at other times in the menstrual cycle (for reviews, see Gangestad & Thornhill, 2008; Jones et al., 2008). Although most of this research has focused on physical traits, two recent studies have reported that women tested near ovulation also show elevated preferences for videotaped displays of men's dominance-related behaviors (Gangestad, Garver-Apgar, Simpson, & Cousins, 2007; Gangestad, Simpson, Cousins, Garver-Apgar, & Christensen, 2004). Dominant behaviors may signal direct benefits via greater access to material resources (see Sadalla, Kenrick, & Vershure, 1987); alternatively, the stronger preferences for such behaviors near ovulation have been interpreted as evidence that dominance-related behaviors may complement morphological features in acting as cues to men's heritable health and fitness (Gangestad et al., 2004). On either account, cycle phase shifts in preferences for dominance may represent stronger attraction to behavioral signals of phenotypic quality during times of higher fertility.

Because the menstrual cycle is regulated by reliable shifts in hormone concentrations, recent studies have begun to identify the proximate hormonal signals that may regulate fertility-related shifts in women's mate preferences (Garver-Apgar, Gangestad, & Thornhill, 2008; Jones et al., 2005a; Puts, 2006; Roney & Simmons, 2008; Welling et al., 2007). A primary goal of this study is to extend these findings and integrate them with the findings regarding cycle phase shifts in women's preferences for dominant behavior. To this end, the present research examines women's estimated hormone concentrations across the menstrual cycle in relation to their self-reported preferences for dominant personality traits.

At least two functional theories have been proposed to explain menstrual phase shifts in women's attractiveness judgments. The most prominent of these we will refer to as "mixed-mating theory" (see Gangestad & Thornhill, 2008; Penton-Voak et al., 1999). Mixed-mating theory proposes the existence of mechanisms that increase attraction to masculine features during the "fertile window" (the days of a cycle when conception is possible – approximately, the day of ovulation and the preceding five days), which evolved to motivate copulation with men who had higher quality genes than may have been available from a woman's primary partner. This argument posits that the potential costs to a woman from cheating on her primary partner (e.g., abandonment or violence if an infidelity was discovered) would have been constant across the menstrual cycle, but the potential benefits of obtaining higher quality genes could only have been realized within the fertile

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window when conception could occur. As such, proponents of this position argue that it may have been functional to down-regulate interest in cues to genetic quality during infertile times of the cycle in order to reduce the motivation for infidelity and thus maintain the benefits of a long-term relationship, while up-regulating interest in cues to genetic quality during the fertile window in order to motivate an opportunistic search for the best genes for one's offspring.

Between-cycle theory (Roney, 2009; Roney & Simmons, 2008), by contrast, proposes mechanisms designed to produce preference shifts *between different menstrual cycles*, with stronger attraction to masculine traits across cycle days in more vs. less fertile cycles. Given that pregnancy, lactation, and energy shortage can suppress or eliminate women's fertility (for a review, see Ellison, 2001), it is likely that women throughout most of human evolution experienced fertile cycles quite rarely – given typical birth spacing in modern natural fertility populations, women in ancestral environments may have experienced fully fertile cycles for only a few months every 4–5 years (see Strassmann, 1997). Estrogen concentrations, furthermore, are known to index cycle fertility, with higher probabilities of conception in cycles with higher estrogen (e.g., Lipson & Ellison, 1996). Brain mechanisms could thus use estrogen as an index of the fertility of a given menstrual cycle and increase scrutiny of men's mate attractiveness during more fertile cycles. This may have functioned to adaptively allocate attention: during long stretches of suppressed fertility, reduced attention to men's sexual attractiveness may have facilitated motivational prioritization of adaptive problems such as foraging or care of young children; during the rare fertile cycles, though, increased attraction to masculine traits (across the cycle and not just during the fertile window, since courtship and mate choice can occur on any cycle day) may have increased the probability of mate choice leading to the production of healthier offspring. Since estrogen generally peaks near ovulation within cycles in addition to indexing fertility between cycles, an estrogen-based between-cycle mechanism might also generate within-cycle preference shifts even if it were primarily designed to change psychology across different cycles.

Although within- and between-cycle mechanisms are likely not mutually exclusive, pure versions of the mixed-mating and between-cycle theories do generate some conflicting empirical predictions. Mixed-mating theory predicts that preference shifts should be coupled to the timing of the fertile window, since this is the only time that women could acquire the genetic benefits that might outweigh the potential costs of an infidelity. Between-cycle theory, on the other hand, predicts stronger attraction to more masculine features on any cycle days with elevated estrogen, since higher fertility cycles tend to exhibit higher estrogen across most days of the cycle. Because estrogen peaks during the fertile window within cycles in addition to indexing fertility between cycles, both theories can predict positive correlations between estrogen and markers of phenotypic quality. However, estrogen also typically exhibits a secondary elevation in the luteal phase (the second half of the cycle, after ovulation) of ovulatory cycles and in some cases shows a sustained luteal elevation that may be greater than concentrations seen during the follicular phase (see Allende, 2002). As such, preference shifts that track estrogen alone would not be restricted to the fertile window, and mixed-mating theory should therefore predict that other signals may supplement estrogen in more tightly demarcating within-cycle fertility. These signals might be provided by other hormones that peak sharply near ovulation (e.g., luteinizing hormone (LH), follicle-stimulating hormone (FSH), prolactin; see Puts, 2006) or by a hormone like progesterone that peaks during the luteal phase and thus could act as a stop signal for preference shifts (see Jones et al., 2005a).

Previous studies have provided conflicting evidence regarding which hormones correlate with women's preference judgments. Two studies have reported that estrogen concentrations are positively associated with preferences for putative cues to phenotypic quality. Garver-Apgar et al. (2008) estimated six cyclically-fluctuating hormones, and found that estrogen positively predicted women's preferences for the scent of men's symmetry when associations with all other hormones were statistically controlled. Similarly, Roney and Simmons (2008) found that salivary estrogen (and not testosterone or progesterone) was the lone predictor of women's preference for facial cues of men's actual testosterone concentrations. Other studies, though, have reported that preferences for masculinized features are negatively correlated with estimated progesterone (Jones et al., 2005a; Puts, 2006), positively correlated with salivary testosterone (Welling et al., 2007), and positively correlated with estimated prolactin (Puts, 2006). Only Roney and Simmons (2008), however, examined correlations by phase of the cycle and showed that women's testosterone preferences continued to track their estradiol concentrations beyond the fertile window and into the luteal phase, which is an empirical pattern specifically predicted by between-cycle theory.

This study tested for hormonal correlates of possible cycle phase shifts in women's self-reported preferences for dominant personality traits. Following others (DeBruine, Jones, & Perrett, 2005; Garver-Apgar et al., 2008; Jones et al., 2005a; Puts, 2006), we assigned estimated values of six cyclically-fluctuating hormones to the cycle days on which women were tested based on published estimates of the typical values of these hormones on the days in question. We then related these estimated hormones to women's ratings of personality trait terms representing dominance, kindness, and trustworthiness. Because Gangestad et al. (2007) reported cycle phase shifts in preferences for perceived dominance but not for traits such as warm or intelligent, we expected that only preferences for dominance would correlate with estimated hormone values. Based on between-cycle theory, we specifically predicted estimated estrogen to positively correlate with preferences for dominance, while no strong predictions were made regarding the other hormones.

## 2. Methods

### 2.1. Participants

Participants were 240 undergraduate women ( $M$  age = 19.68 years,  $SD = 1.0$ ) enrolled in undergraduate courses at UCSB, who either volunteered or were issued partial course credit for participation.

### 2.2. Procedures and materials

After completing an informed consent document, women completed a trait preference survey and a menstrual cycle survey, each described below, in groups of 5–30.

#### 2.2.1. Trait preference survey

The authors compiled a large list of personality trait terms from which two graduate students and the authors themselves nominated terms that met one of the following definitions:

(1) *Dominance*: the tendency to use forceful and competitive tactics as a means of promoting desired outcomes and achieving status in a social hierarchy; (2) *Kindness*: a tendency to benefit others by providing resources or social support at a cost to oneself (or behavior that communicate one's willingness to do so); (3) *Trustworthiness*: a tendency to behave in accord with one's expressed intentions over the short- and long-term, including those to remain

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