



## Original Article

# Hormonal contraceptive use lowers female intrasexual competition in pair-bonded women

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## ABSTRACT

The purpose of this study was to test the influence of hormonal contraceptive use on levels of female intrasexual competition. Twenty-eight women completed a scale for intrasexual competition on three occasions: when using hormonal contraceptives and when regularly cycling at a fertile and a non-fertile cycle stage. When using hormonal contraception, pair-bonded, but not single women, reported significantly lower levels of intrasexual competition than when regularly cycling at either fertile or non-fertile cycle stages. This effect remained significant when controlling for age, length of relationship and relationship satisfaction. Neither pair-bonded nor single women reported shifts in intrasexual competition across the menstrual cycle when fertile as compared to non-fertile. This study benefited from a within-subjects design and a more rigorous assessment of fertility status (transvaginal ultrasonography) than which is typical in the field. Results are discussed in consideration of the evolutionary literature on the stability of romantic relationships and fitness advantages associated with intrasexual competition.

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## 1. Introduction

Over 50 years have elapsed since the introduction of hormonal contraceptives (HCs). During this time a great deal of research targeting the study of physical risks associated with their use has been generated (e.g., Kiley & Hammond, 2007). A new but growing body of literature suggests that in addition to physical effects, HC use may also have various psychological effects. In particular, the use of HCs may alter female preferences for indicators of male genetic quality and compatibility (Alvergne & Lummaa, 2010; Roberts et al., 2008). For example, a study by Gangestad and Thornhill (1998) found that pill users do not show a preference for the scent of symmetrical men (an indicator believed to be associated with genetic quality), or changes in symmetry preference across the month when fertile. Moreover, studies investigating attractiveness ratings show that there is no variation in such ratings across the cycle in men rating contraceptive users or in contraceptive users' own preferences across the cycle (e.g., Kuukasjärvi et al., 2004; Pipitone & Gallup, 2008; Miller et al., 2007; Penton-Voak et al., 1999). Such alterations may potentially have evolutionary repercussions on relationship formation, long-term relationship satisfaction, and upon actual reproductive outcomes.

In the present research, using a within-subjects design, we tested the influence of HC use on levels of female intrasexual competition. While studies investigating the impact of HC's typically compare between-subjects who are using HC and those who do not, using a within-subjects design is critical because women who use HC may differ on a number of dimensions (e.g. religiosity, economic status, relationship status) from non-users (Manlove et al., 2007; Kusunoki & Upchurch, 2011; Guendelman et al., 2000). Intrasexual competition refers to competition between members of one sex for access to mating opportunities with members of the opposite sex (e.g., Darwin, 1871; Andersson, 1994). It can involve direct physical competition but often, particularly between women, takes the form of more subtle behaviours such as competitor derogation (e.g., Buunk & Fisher, 2009; Fisher, 2004). While relative differences in gamete size and the evolution of parental care may influence sex differences in the intensity of competition, with men typically competing to a higher extent for partners than women, certain situations are associated with a greater likelihood of female intrasexual competition (Trivers, 1972). For instance, in environments where men differ in their ability to provide resources or differ in physical health, such that there are few 'good men', intrasexual competition may be adaptive. In addition, competition may be elevated in individuals or environments where women need men more for resource provisioning or protection. Work by Burbank (1987) has shown that among women in polygynous societies living as co-wives competition exists over

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food, money and paternal care. In these instances intrasexual competition can be considered adaptive in that it allows a woman to compete more fiercely to successfully attract a partner and monopolize resources.

Previous research suggests that intrasexual competition relating to attractiveness varies across the menstrual cycle, with higher levels reported when fertile as compared to non-fertile. For example, Fisher (2004) showed that women derogate female, but not male, faces more when fertile as compared to non-fertile. Similarly, work by Durante, Li, and Haselton (2008) and Durante, Griskevicius, Hill, Perilloux, and Li (2011) has shown that women non-consciously select consumer products which might enhance their attractiveness (e.g., sexy clothing) when fertile as compared to non-fertile. These findings have been explained in light of the idea that, when conception is possible, women have a greater desire to outdo attractive rivals to attract a high quality mate. In line with this idea, research by Vukovic and colleagues (2009) has shown that post-menopausal women are less derogating of attractive (feminine) female faces than pre-menopausal women. Indeed, postmenopausal women have less to gain from derogating same-sex rivals since they can no longer conceive. In light of these findings, herein we compared levels of intrasexual competition when using HCs to both fertile and non-fertile cycle stages. To do this accurately, we used transvaginal ultrasonography which measures actual follicular size, to determine fertility. This methodology improves upon the crude, yet typically used (e.g. Fisher, 2004; Miller et al., 2007) 'counting method' which assigns fertility through counting forward or backwards from the onset of menses to roughly gauge fertility status. Transvaginal ultrasonography also allows for the detection of anovulatory cycles in which LH surges occur but ovulation fails to follow.

It was predicted that women would report lower levels of intrasexual competition when using HCs as compared to when regularly cycling. Low levels of intrasexual competition may be detrimental to female fitness since it may mean that women are less likely to achieve or maintain high quality partners and investment. Our prediction that intrasexual competition will be lower during HC use is primarily based on the idea that HCs suppress the production of natural hormones including testosterone (Bancroft et al., 1991; Alexander et al., 1990; Swinkels et al., 1988). There is a large and diverse literature relating testosterone to competitive behaviour. For example, in female sporting competition testosterone is known to increase in anticipation of competition and is negatively related to losing (Bateup et al., 2002). Women have also been shown to release adrenal steroid hormones such as testosterone to facilitate courtship behaviour with high quality males. Preliminary evidence also suggests that HC use may disrupt this natural inclination to compete to obtain a mate: women using HCs did not experience increases in testosterone when in the presence of an attractive man (López, Hay, & Conklin, 2009). Research by a number of investigators has also shown that higher dominance scores are associated with higher serum testosterone levels (e.g., Grant & France, 2001; Mazur & Booth, 1998; Mehta et al., 2009; Mehta & Josephs, 2010). Certainly, testosterone has been shown to be positively related to dominance behaviour across a wide range of species (e.g., Anestis, 2006; Beehner et al., 2005; Gould & Ziegler, 2007). Some evidence suggests that dominance rank in non-human primates is related to actual reproductive success, which clearly indicates the adaptive value of competing to achieve high rank (e.g., Dunbar & Dunbar, 1977; Noordwijk & van Schaik, 1999; Pusey et al., 1997).

If dominance is involved in the expression of intrasexual competition, then one would expect women using HCs to have lower levels of intrasexual competition. There is indeed evidence for a relationship between self-reported dominance (as measured by IPIP <http://ipip.ori.edu/ipip/>) and intrasexual competition (as measured by Buunk & Fisher, 2009) among women (unpublished data bivariate correlation:  $r = 0.30$ ,  $p < 0.0001$ ,  $N = 330$  women).

In contrast to our idea that testosterone suppression might modify female–female competitive behaviour, other researchers have speculated that increases in estrogen mid-cycle underlie differences in competitive behaviour across the cycle. While this may be valid, it is also plausible that testosterone or a number of different hormones, or interactions of combinations of hormones, underlie these changes. To our knowledge no research has actually empirically shown that individual differences in measured estrogen reliably predict differences in intrasexual competition. Similarly, we know of no study showing that differences in the magnitude of estrogen change prior to ovulation (either between women or between months within an individual) actually relates to intrasexual competition. The concept that estrogen governs shifts across the menstrual cycle is however in line with research which has shown that individual differences in estrogen predict preferences for physical features such as masculinity assumed to be indicative of good genes (e.g., Feinberg et al., 2006; Roney & Simmons, 2008) and similarly that within-women shifts in estrogen predict attraction to cues of men's testosterone (Roney et al., 2011).

If intrasexual competition is governed by testosterone as we assume, we might expect to see higher levels among women when fertile as opposed to non-fertile since testosterone has been shown to fluctuate cyclically increasing from menstruation to mid-cycle in proximity to ovulation (Alexander et al., 1990; Bloch et al., 1998; Morris et al., 1987; Persky et al., 1978; Welling et al., 2007; Judd & Yen, 1973). However, other research suggests that changes in testosterone across the cycle, while significant, can be ignored since daily fluctuations (due to circadian rhythm) and seasonal fluctuations are greater (e.g., Dabbs and de La Rue, 1991). Some research even indicates that testosterone levels are stable across the menstrual cycle (e.g., Pearlman et al., 1967; Dabbs, 1990; Schultheiss et al., 2003; Van Goozen et al., 1997; Leining et al., 2010). If this is true, and if testosterone shifts underlie the effects, we would not necessarily expect a difference in intrasexual competition scores between the fertile and non-fertile phases of the cycle. Furthermore, since we use a scale to measure general intrasexual competition and not competition specific to attractiveness, it is unlikely that shifts in general intrasexual competition across the menstrual cycle would be evolutionarily adaptive.

## 2. Methods

### 2.1. Participants

Participants were recruited from a pre-existing pharmaceutical trial. Details of participant exclusion criteria and recruitment procedures to the trial have previously been published (see Cobey et al., 2012). Participants were 28 women aged between 20 and 31 years ( $M = 22.90$  years,  $SD = 2.49$ ). Fourteen women reported to be in a relationship and fourteen reported to be single. Participants were paid for their participation in the study.

### 2.2. Measures

Participants completed Buunk and Fisher's (2009) 12-item scale for intrasexual competition three times: when using HCs, when fertile, and when non-fertile. Using 1–7 Likert scales, participants reported how applicable each of the scale items was to them (with endpoints labelled 'not at all applicable to me' to 'completely applicable to me'). Examples of scale items include, "I want to be just a little better than other women." and "I tend to look for negative characteristics in women who are very successful". The scale had high reliability across items at each time measure (Cronbach's alphas between 0.8 and 0.9). Pair-bonded participants were also asked at each survey measure to report how satisfied they were in their relationship. Scores were obtained from a single-item question, on a

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