Effects of partner conception risk phase on male perception of dominance in faces

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Abstract

Several studies have suggested that women may prefer to engage in extra-pair copulations with males who appear dominant and to do so near ovulation. While there is some evidence that males are more jealous of dominant rivals and more proprietary when their partners are near ovulation, there is none that suggests the existence of counterstrategic perceptual shifts that mirror those seen in women. We provide such evidence here. Composites of male faces that were either high or low in rated dominance were presented to male participants who provided ratings of dominance. A three-way interaction between stimulus-face dominance, partner conception risk phase, and partner oral contraceptive use was found; men whose partners did not use an oral contraceptive and were in the high conception risk phase of their cycle displayed increased dominance ratings of high-dominance male faces. We conclude that males have evolved counterstrategies to deal with female infidelity that include an overattribution of dominance to those rivals most likely to present a threat at times when that threat is greatest. This overattribution is likely to lead to increases in jealousy and mate-retention behaviors.
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1. Introduction

There is accumulating evidence that women's preferences for male physical appearance vary as a function of fertility status. When in the follicular phase of their cycle, women find masculine-faced men more attractive (Johnston, Hagel, Franklin, Fink & Grammer, 2001; Frost, 1994; Penton-Voak & Perrett, 2000; Penton-Voak et al., 1999) and prefer the voices of more masculine men (Puts, 2005) and the odor of more dominant and symmetrical men (Gangestad & Thornhill, 1998; Havlicek, Roberts, & Flegr, 2005; Rikowski & Grammer, 1999; Thornhill & Gangestad, 1999a, 1999b; Thornhill et al., 2003). Furthermore, women express cycle-related shifts in their preference for personality traits and behaviors related to masculinity and dominance, a pattern which has been shown to hold true even when controls are made for the effects of male physical attractiveness (Gangestad, Simpson, Cousins, Garver-Apgar, & Christensen, 2004).

It is argued that these findings are in line with evolutionary predictions because traits for which women show cyclic preference shifts may be honest signals of immunological competence (Følstad & Karter, 1992; Mueller & Mazur, 1997; Thornhill & Gangestad, 1999b), and females can only accrue heritable benefits from sexual partners if conception follows copulation. Intriguingly, preference shifts seem only to occur in normally ovulating women. The use of oral contraceptives has been shown to nullify preference shifts in both the visual and olfactory modalities (Gangestad & Thornhill, 1998; Penton-Voak et al., 1999).

A preference for males who display markers of genotypic superiority may lead women to pursue a mixed mating strategy, whereby males with a more feminine appearance are secured as long-term partners while males who appear more masculine are engaged as extra-pair copulation (EPC) partners. In support of this hypothesis, women have been shown to be more attracted to extra-pair males when fertile (Gangestad, Thornhill, & Garver, 2002). Women are also more likely to visit a singles nightclub without a primary partner during the fertile phase of their cycle (Grammer, Jutte, & Fischmann, 1997) and report a greater frequency of EPCs as occurring at the follicular phase, though copulations with primary partners are spread more evenly over the cycle (Bellis & Baker, 1990).

With human extra-pair paternity estimates ranging between 1% and 30% (MacIntyre & Sooman, 1991), it seems unlikely that men would not have developed specific adaptations to prevent their partners from engaging in EPCs. One such adaptation may be male sexual jealousy, which is hypothesized to induce men to deter mates from seeking extra-pair partners and/or to guard against the approaches of potential extra-pair partners (Buss & Shackelford, 1997; Goetz et al., 2005). Behaviors motivated by jealousy may be costly, both in terms of the increased possibility of incurring injury at the hands of rival men and of causing a mate to dissolve the partnership. Ancestrally, men may have benefited by being more sensitive to those rivals who presented the greatest threat (i.e., masculine men). Because it is known that men experience greater romantic jealousy if their rivals exhibit characteristics such as physical and social dominance (Dijkstra & Buunk, 2001; 2002) and that jealousy provokes mate-retention behaviors (Buss, 1988; Buss, Larsen, Westen, & Semmelroth, 1992), it is possible that the overattribution of dominance to rivals who pose the greatest threat is a cognitive precursor to romantic jealousy and mate-retention behaviors.

Men may also have benefited historically by an increased sensitivity to rivals at times when the threat of partner infidelity was greatest (i.e., when their partners were in the periovulatory phase). If an associated cost of mate guarding is the increased likelihood of a partner's desertion, a sensitivity to rivals that is uniformly high and does not vary with the risk of partner infidelity would be maladaptive. Though ovulation is not conspicuously advertised in humans, there is some evidence that men possess indirect knowledge of when women are ovulating (Roberts et al., 2004; Singh & Bronstad, 2001). Therefore, counter-adaptations that aim to prevent female engagement in EPCs at the periovulatory phase are possible as well as desirable.

The current study attempted to test these hypotheses by examining the effect of partner menstrual phase on men's ratings of dominance of composite male faces constructed from images of men differing in rated dominance.

2. Method

2.1. Stimuli

Sixty-six male facial photographs, taken using a digital camera under standardized conditions, were selected from a larger pool of pictures based on neutral expressions, closed mouths, and no facial jewelry or hair covering the brow. Images were normalized on interpupilary distance, cropped below the chin, and resampled to 400×512 pixels.

All images were rated for dominance on a seven-point scale by 11 men (mean age=26.18 years; S.D.=6.84). For the purposes of rating, a dominant person was defined as someone who "appeared as though they could get what they wanted." Alpha reliability coefficient was high (α=.755), demonstrating that participants were in agreement as to the cues that signal a dominant appearance. The faces were then ranked according to mean dominance scores and split into sets of three (three highest ranking, three next highest ranking, and so on). The three faces in sets 1, 2, and 3 (high dominance) and 20, 21, and 22 (low dominance) were blended using computer graphics techniques (Tiddeman, Burt, & Perrett, 2001) to give six composites that should theoretically differ in perceived dominance (Fig. 1). Hereafter, composites shall be referred to by number: composite 1 was that derived from the three most dominant faces and composite 22, that derived from the three least dominant faces.

2.2. Participants

Participants were 110 heterosexual men with female partners, who were recruited via advertisements made on a university computer network messaging system. The advertisement directed participants to a webpage, which was accessible worldwide but was not advertised elsewhere. The data of all participants who did not report whether their partner used an oral contraceptive (five), or who stated they were unsure as to whether their partner used an oral contraceptive (four), were omitted. The data of a further 27 participants who

Fig. 1. Composites based on male dominance judgments. (A) comprises the three faces with the highest dominance scores (ranks 1–3), while (B) comprises the three faces with the lowest scores (ranks 64–66). A further four composites were created using faces ranking 6–8, 9–11, 58–60, and 61–63.

were unable to provide a date (or who expressed uncertainty over a provided date) for the onset of their partner's previous or current menses were also omitted. Finally, to ensure that the final sample comprised only participants who had been in a relationship with their current partner for more than 1 month (i.e., been with their partner during a full menstrual cycle), the data of one participant who reported a relationship length of 1 month and the data of nine participants who did not report the length of their current relationship were also omitted. This left a sample of 64 men (mean age=28.58 years; S.D.=8.97). Of the 64, 34 self-reported British nationality, and 59 described their ethnicity as "white". All participants were naïve as to the aims of the current investigation. No rewards were offered for participation.

The partners of 33 of the participants fell into a "high risk of conception" category based on days since onset of last or current menses (defined below), and 31 fell into a "low risk of conception" category. Oral contraceptives were reported to be used by 16 women in each "conception risk" category.

2.3. Procedure and measures

Composites 1–3 and 20–22 (a total of six images) were rated for dominance using a seven-point Likert scale (1=not at all dominant, 7=very dominant). The definition of dominance given was identical to that provided above. Composites were presented in a random order.

Each participant's ratings of composites 1–3 were averaged to provide a mean dominance score for faces high in dominance. An identical calculation was performed using ratings of composites 20–22 (low dominance).
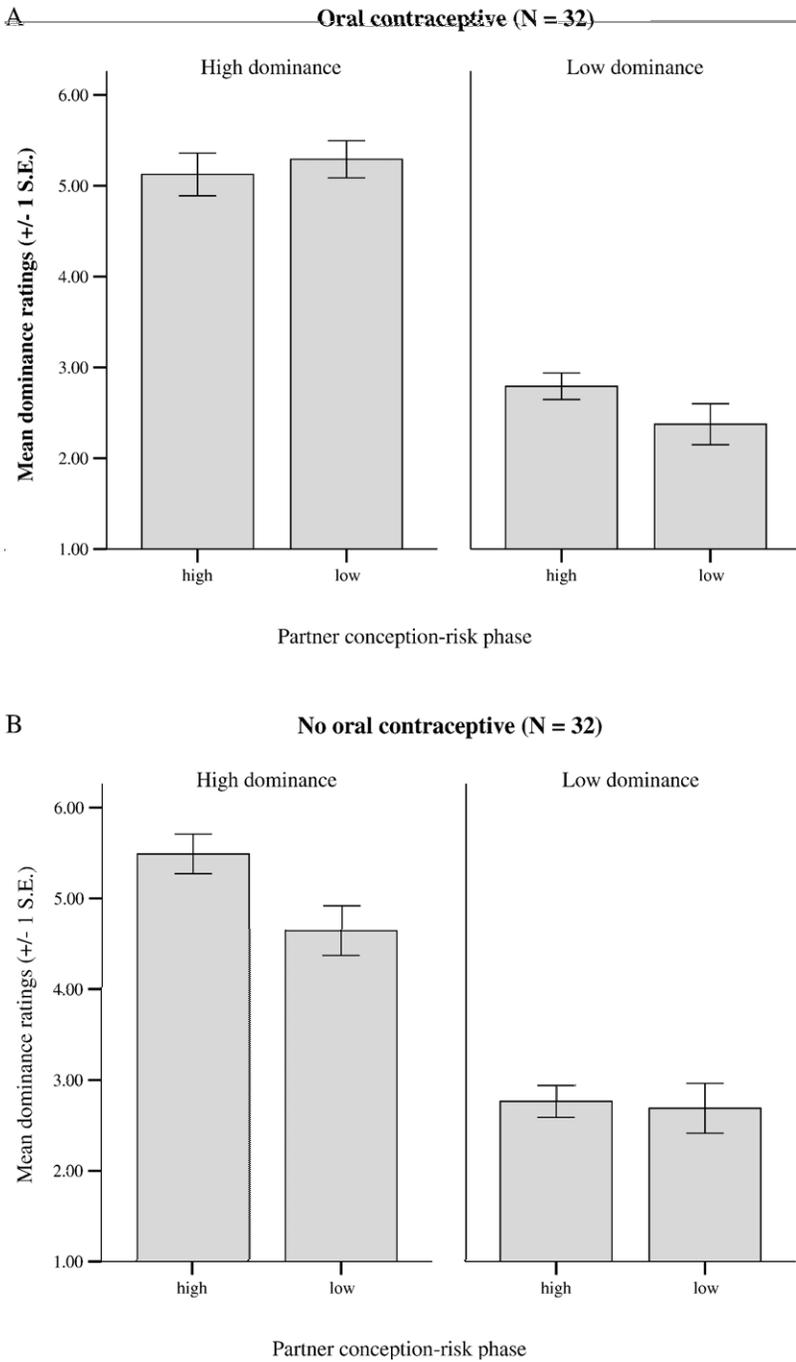
Fig. 2. Mean ratings of dominance applied to composites grouped by dominance (derived from previous ratings), as a function of partner conception risk phase. (A) shows ratings made by males whose partners use an oral contraceptive, while (B) shows the ratings made by males whose partners do not.

Participants also provided information on relationship length, whether or not their partner used an oral contraceptive (men were given the options "yes," "no," and "not sure"), and a date for the onset of their partner's previous or current menses. Where men reported onsets using a number of days (e.g., "6 days ago"), days since onset was coded as the number of days quoted plus one (so a response of "6 days ago" would mean the number of days since onset, including that on which onset occurred, equaling 7). In addition, men were asked to state how certain they were that their partner's menses had begun on the day quoted.

Days since onset of partner's previous or current menses was used to derive an index of partner's conception risk (after Penton-Voak & Perrett, 2000). The partners of men who were currently at days 7–15 of their cycle were classified as being at a high risk of conception. All others were classed as being at a low risk of conception.

3. Results

A $2 \times 2 \times 2$ repeated-measures analysis of variance was used to compare mean ratings of dominance applied to composites in the two dominance sets (high/low) as a function of "conception risk phase" (referring to partner's conception risk, high/low) and "oral contraceptive use" (of partner, yes/no). While those using oral contraception do not differ in conception risk across the cycle, the same terminology is used here for comparison.

As composites had been selected for their differences in terms of perceived dominance, a strong main effect of image dominance was evident [$F(1,60)=352.78$; $p<.001$]. However, there was no main effect of partner conception risk phase [$F(1,50)=2.75$; $p=.1$]; neither were there interactions between risk phase and image dominance [$F(1,60)=.12$; $p=.73$] nor risk phase and partner oral contraceptive use [$F(1,60)=.9$; $p=.35$].

The three-way interaction between composite-face dominance, partner conception risk phase, and partner oral contraceptive use was significant [$F(1,60)=6.55$; $p=.013$] (see Fig. 2). The interaction indicates that males whose partners use an oral contraceptive rate faces similarly regardless of whether or not their partner is in the high or the low conception risk phase, while males whose partners do not use an oral contraceptive apply lower ratings of dominance to dominant faces, though only if their partner is at a low risk of conceiving.

Separate analyses for participants whose partners did and did not use an oral contraceptive were conducted: the interaction between composite-face dominance and partner conception risk phase was not significant for males whose partners used an oral contraceptive [$F(1,30)=2.65$; $p=.11$], though it was marginally significant for males whose partners did not [$F(1,30)=3.91$; $p=.057$]. Independent samples *t* tests showed that men whose partners used an oral contraceptive rated dominant faces, [$t(30)=.54$; $p=.6$] and submissive faces [$t(30)=1.55$; $p=.13$] no differently as a function of partner conception risk phase, while men whose partners did not use an oral contraceptive applied higher ratings to dominant faces if their partner was at a high risk of conception than if she was at a lower risk [$t(30)=.42$; $p=.02$]. There was no effect of risk phase on ratings of submissive faces made by males whose partners did not use an oral contraceptive [$t(30)=.09$; $p=.81$].

4. Discussion

The current study shows that men whose partners are in the follicular phase of their cycles perceive composite male faces constructed from images rated high in dominance to be more dominant than do men whose partners are at other phases, though only if their partner does not use an oral contraceptive.

These results are consistent with the prediction that men exhibit a condition-dependent shift in their perceptions of rival males that mirror the preference shifts described in women by previous studies. Rivals who pose the greatest threat (those with a dominant appearance) are perceived as more dominant by men whose partners are at a high risk of conception than by men whose partners are at a low risk of conception. That there were no significant differences in the ratings of submissive composites as a function of partner menstrual phase suggests that men's attentions are directed selectively towards those rivals with whom women are most likely to commit EPCs. A more general shift which resulted in perceptions of greater dominance in all male faces would be maladaptive in that it would prompt men to engage in costly mate-retention behaviors at times when they would be inappropriate and may lead to greater fitness costs than benefits.

The perception shift appears not to be dependent solely upon temporal indices of ovulation (i.e., the occurrence of menses 1 to 2 weeks previously), as partner oral contraceptive use interacted with composite-face dominance and partner conception risk phase. Possible cues to ovulation in a partner may be found in her facial appearance or body odor and may be mediated by increases in her attractiveness (Roberts et al., 2004; Singh & Bronstad, 2001). This is a possibility that warrants further investigation, particularly in light of findings suggesting that men who are partnered with more physically attractive women report using mate retention tactics more frequently than do men who are not partnered with such women (Goetz et al., 2005). Future studies that seek to determine the importance of focal male attractiveness in partner cycle-related perception shifts may also be useful, given evidence suggesting that women partnered with less attractive men report greater attraction to extra-pair males than do women with mates who possess attractive traits (Gangestad, Thornhill, & Garver-Apgar, 2005) and that men who do not possess valued traits experience greater sensations of jealousy (Brown & Moore, 2003).

Examining ratings of a single trait in faces that had been manipulated to appear at opposite ends of a continuum of that same trait is a limitation of the current study. It is possible that ratings of other traits would differ as a function of manipulated dominance or that ratings of dominance would differ should images be manipulated on some other trait, though no conclusions can be drawn regarding this possibility.

Women using non-pill-based hormonal contraceptives were not incorporated into a general group along with oral contraceptive users in the current study. Unpublished data on our sample population suggest that approximately 60% of partnered women use a hormonal contraceptive of some kind. Of the 110 partnered males in our original sample, 44.5% reported that their partner used an oral contraceptive. Though males are likely to underestimate partner pill use, this suggests that non-pill-based hormonal contraceptives are used by around 15% of the partnered females in our study population. However, one

would expect that including males whose partners use a non-pill-based hormonal contraceptive in our current sample of "males whose partners do not use an oral contraceptive" would drive our results away from significance and, therefore, our findings are robust.

Future studies should seek to address these issues. Links should also be drawn between perceptual shifts such as that which is described here and changes in male jealousy and mate-guarding behaviors.

In summary, our results imply the existence of a context-dependent mechanism that promotes male mate-retention behaviors. Such a mechanism should only be activated when mate-retention behaviors are likely to result in fitness benefits that outweigh costs. Activation should be influenced by several factors, including timing and traits of the potential EPC partner that are related to the likelihood of an EPC occurrence. Because women are more likely to engage in EPCs with dominant males and to do so when in the periovulatory phase of their cycles, men should preferentially mate-guard against dominant rivals at times when their partners are most fertile. The current study, which shows that men overattribute dominance, a characteristic related to jealousy (Dijkstra & Buunk, 2001; 2002) and, hence, to mate-retention behavior (Buss, 1988; Buss et al., 1992), to composite faces created from images of individuals rated high in dominance, when their partners are at a high risk of conception and do not use an oral contraceptive, suggests that this may be the case.

Acknowledgments

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