

Men's Perceived Partner Commitment and Mate Guarding: The Moderating Role of Partner's Hormonal Contraceptive Use

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Male jealousy is an adaptive interpersonal process that functions to maintain relationships by reducing the likelihood of partner sexual infidelity. Ancestral men would have been most reproductively successful to the extent that they responded to signs of low partner commitment with increased jealousy and mate guarding. The current research showed that, indeed, newlywed husbands who perceived relatively low commitment in their new wives displayed relatively high levels of mate guarding. However, this relationship was moderated by wives' use of hormonal contraceptives (HCs). HCs can unconsciously reduce women's sexual signaling behaviors and, therefore, may eliminate the extra-pair sexual signaling likely to promote male mate guarding. Consistent with predictions, among husbands with wives not using HCs, relatively low levels of perceived partner commitment were associated with relatively high levels of husbands' mate guarding. Among husbands with wives using HCs, in contrast, husbands' perceived partner commitment was unassociated with husbands' mate guarding. This finding joins others in suggesting that the use of HCs, often used in the context of long-term committed relationships, can unknowingly interrupt evolved relationship processes.

Keywords: mate guarding, partner commitment, hormonal contraceptives, sexual signaling, marriage

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The possibility of cuckoldry has been a threat to men's reproductive fitness throughout human evolutionary history. Consequently, men possess adaptive psychological mechanisms that counteract the threat of partner sexual infidelity (Buss, Larsen, Westen, & Semmelroth, 1992; Maner, Miller, Rouby, & Gailliot, 2009). These mechanisms have been demonstrated across diverse populations and situational contexts (e.g., Buunk, Angleitner, Oubaid, & Buss, 1996) and have profound implications for a variety of proximate relationship processes including distrust and fear of abandonment (Charny & Par-

nass, 1995), decreased self-esteem and confidence (Shackelford, 2001), and increased risk of mental health problems (e.g., depression and anxiety; see Cano & O'Leary, 2000).

Nevertheless, one factor that may unknowingly buffer against men's vigilance to partner sexual infidelity may be their partners' hormonal contraceptive (HC) use. HCs are known to interrupt some of the natural fluctuations in female sexuality that give rise to men's concerns about partner infidelity (e.g., Haselton & Gangestad, 2006; Miller, Tybur, & Jordan, 2007). Indeed, because HCs prevent conception, they also unconsciously prevent the underlying adaptive problem—being cuckolded—that ultimately gives rise to male jealousy. The current article presents data suggesting that women's HC use may undermine the normal association between men's perceptions of the extent to which their long-term partners are committed and the extent to which they engage in preventative acts of mate guarding (e.g., jealousy).

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Evolutionary Perspectives on Male Responses to Sexual Infidelity

Sexual infidelity has reproductive costs that would have been particularly detrimental for men throughout human evolutionary history (see Shackelford, Buss, & Bennett, 2002). Whereas ancestral women would have continued to receive reproductive benefits (e.g., protection, resource acquisition, and parental care) from their partners who engaged in extra-pair copulations (EPCs; as long as those partners remained committed), ancestral men would have experienced detrimental costs from their partners' EPCs (even when those partners remained committed). Specifically, ancestral men whose partners engaged in EPCs would have been threatened by the possibility of cuckoldry, which is damaging to male reproductive success in at least three ways. First, because women experience lengthy internal gestation followed by lactation and a period of infant dependency, cuckolded men must endure a lengthy waiting period before they have another opportunity to reproduce with their partners. Second, cuckolded men also risk the possibility of investing considerable resources and parental care in genetically unrelated offspring, which detracts from investments in their own offspring and future reproductive opportunities. Finally, cuckolded men risk the possibility of relationship dissolution if their partners commit to the EPC partners. Consistent with the notion that sexual infidelity can be especially damaging for men's reproductive success, men report that partner sexual infidelity is more distressing than emotional infidelity (Buss et al., 1992; Goldenberg et al., 2003; Pietrzak, Laird, Stevens, & Thompson, 2002) and they demonstrate higher levels of physiological distress (e.g., increased heart rate, increased electrodermal response) in response to sexual versus emotional partner infidelity—a pattern that emerges cross culturally (Buunk et al., 1996).

Detecting and Preventing Partner Sexual Infidelity

Given these risks associated with partner sexual infidelity, ancestral men's reproductive success would have depended on the extent to which they engaged in behaviors that reduced the likelihood of their female partners engaging

in EPCs. Jealousy and associated mate-guarding behaviors reflect one such adaptation (see Brown & Moore, 2003; Buss, 2000; Buss et al., 1992; Daly, Wilson, & Weghorst, 1982; Maner & Shackelford, 2008; Pfeiffer & Wong, 1989; Symons, 1979). Throughout evolutionary history, ancestral men who engaged in detective and protective mate-guarding behaviors (i.e., checking up on their partners, derogating intra-sexual rivals, and preventing intimacy opportunities between their partners and intrasexual rivals; Buss & Shackelford, 1997; Pfeiffer & Wong, 1989) would have increased their likelihood of mate retention by (a) limiting their partners' EPC opportunities, and (b) deterring other men from seeking mating opportunities with their partners. Indeed, empirical evidence demonstrates that experiencing jealousy and guarding one's mate from potential rivals assists with mate retention and protects against cuckoldry (Buss, 1988; Flinn, 1988; Haselton & Gangestad, 2006; Pillsworth & Haselton, 2006; Sheets, Fredendall, & Claypool, 1997).

Nevertheless, engaging in indiscriminate mate-guarding behaviors would not have been adaptive in all intimate relationships. In the context of stable and committed long-term relationships, for example, consistent and repetitive male mate guarding is unwarranted and would likely result in conflict that might drive away female partners (Buss & Shackelford, 1997). Thus, male mate guarding can be conceptualized as a strategic intervention useful primarily in the context of intimate relationships in which the female partners seem likely to stray (Maner et al., 2009).

A lack of partner commitment is often associated with a display of sexual signals (often directed toward alternative partners) that alert men to the possibility of infidelity. Indeed, many behavioral warning signs of sexual infidelity (e.g., sexual boredom with partner, apathy toward partner, increased reference to and time spent with alternative partners; see Buss & Shackelford, 1997) are similar to items included on standard measures of relationship commitment (e.g., Rusbult, Martz, & Agnew, 1998; Stanley & Markman, 1992). Moreover, low levels of relationship commitment are associated with an increased desire for EPC partners (Pillsworth, Haselton, & Buss, 2004) and predict future sexual infidelity (Drigotas, Safstrom, & Gentilia, 1999; Le, Korn, Crockett, & Loving,

2011). Thus, in general, perceptions of low commitment in a long-term partner should be associated with high levels of vigilance toward potential sexual infidelity and guarding one's mate from potential rivals.

Hypothesized Moderating Role of Hormonal Contraception

The current investigation, however, tests the hypothesis that women's HC use moderates the relationship between men's perceived partner commitment and mate guarding. HCs interrupt the normal hormonal fluctuations that characterize women's menstrual cycles, along with fluctuations in women's mating psychology. In the fertile phase of the menstrual cycle (i.e., near ovulation), women sometimes engage in more EPCs (Haselton & Gangestad, 2006) and place a greater priority on the sexual attractiveness of short-term partners (Gangestad, Garver-Apgar, Simpson, & Cousins, 2007) compared with less fertile phases of the menstrual cycle. This increased sex drive has been linked with high levels of estrogen (Roney & Simmons, 2013), and is typically accompanied by a variety of sexual-signaling behaviors such as flirting and wearing provocative clothing (Cantú et al., 2014; Durante & Li, 2009; Durante, Li, & Haselton, 2008; Gangestad, Thornhill, & Garver, 2002; Grammer, Renninger, & Fischer, 2004; Guéguen, 2009, 2012; Haselton & Gangestad, 2006; Haselton, Mortezaie, Pillsworth, Bleske-Rechek, & Frederick, 2007). Such sexual-signaling behaviors play a principal role in motivating male mate-guarding behaviors. Indeed, women's increased sexual signaling may attract the attention of rival mates and may therefore be a salient, warning sign to men that promotes jealousy and mate guarding to help prevent partner sexual infidelity.

Recent evidence suggests that, by eliminating oestrus, HCs interrupt such evolved processes (for a review, see Alvergne & Lummaa, 2010; for an alternative perspective, see Havlíček, Cobey, Barrett, Klapilová, & Roberts, 2015). Indeed, HCs appear to unconsciously suppress the peak in female-initiated sexual activity normally observed at ovulation (Adams, Gold, & Burt, 1978). Additionally, women who use HCs are (a) less receptive to courtship solicitations (Guéguen, 2009), (b) perceived by men as less attractive (Cobey, Buunk, Pollet, Klipping, &

Roberts, 2013; Miller et al., 2007), and (c) demonstrate decreased preferences for male symmetry and masculinity (e.g., Feinberg, DeBruine, Jones, & Little, 2008; Little, Burriss, Petrie, Jones, & Roberts, 2013; Little, Jones, Penton-Voak, Burt, & Perrett, 2002; Penton-Voak & Perrett, 2000). Thus, HCs unconsciously disrupt the increase in short-term sexual psychology typically observed in women mid-cycle. Notably, it is for this reason that HC users are sometimes recruited as a control group in studies of mating-related changes across the menstrual cycle (e.g., Miller et al., 2007).

Because women's sexual signaling is likely to play a key role in motivating men's mate guarding, women who use HCs—even those who are perceived by their male partners as lacking long-term commitment—may not provoke partner jealousy and its associated mate-guarding behaviors to the same extent that normally cycling women do. Thus, the key prediction underlying the current investigation is that, although men's perceptions of low long-term partner commitment should be associated with increased mate guarding, that association may be reduced if those long-term partners use HCs. This prediction is also consistent with the adaptive logic underlying male jealousy. Ancestral men who engaged in mate-guarding behaviors when their long-term partners showed interest in alternative partners would likely have been more reproductively successful because such behaviors prevented cuckoldry. The likelihood of cuckoldry is essentially zero among women using HCs, and such women would also likely exhibit decreased sexual signaling. Thus, men may be less likely to display sexual jealousy or to guard one's mate from potential rivals when she is using HCs. Men whose wives use HCs are unlikely to consciously consider the fact that their long-term partner is unlikely to conceive with an extra-pair partner and thus the possibility of being cuckolded is low. HCs are a relatively modern advancement (evolutionarily speaking) and thus, it is unlikely that men's mating psychology has adapted to react directly to the presence of HCs. Rather, men likely respond directly to the presence of their long-term partners' sexual-signaling behaviors—behaviors that are likely suppressed in women who use HCs. Thus, men whose partners use HCs—even those men who perceive their wives as lacking commitment—would not

be expected to display especially high levels of mate guarding or jealousy.

Overview of the Current Study

We conducted a cross-sectional study of newlywed couples to examine this possibility. Although the predicted interaction should not be unique to marriage, it is most likely to emerge in men's behavioral responses to partner sexual infidelity by a long-term partner (vs. a short-term partner). As others have argued (see Meltzer, McNulty, Jackson, & Karney, 2014), studying marriages rather than dating relationships provides a way to maximize couples' long-term relationship orientation. In the current study, wives reported their HC use and husbands completed measures of perceived partner commitment, mate guarding, and cognitive jealousy. We predicted that the association between husbands' perceived partner commitment and mate guarding/jealousy would depend on their wives' HC use. Specifically, we predicted that whereas perceived partner commitment would be negatively associated with mate guarding among men whose wives are not using HCs (because such wives are likely engaging in relatively higher levels of sexual signaling), perceived partner commitment would be unassociated with mate guarding among men whose wives are using HCs (because such wives are likely engaging in relatively lower levels of sexual signaling).

Method

Participants

Participants were 113 first-married newlywed couples participating in a broader longitudinal study investigating romantic-relationship processes. All participants were recruited through invitations sent to couples who had applied for marriage licenses in the county (Dallas County) near the study location (north Texas). Three hundred eighty-nine couples responded to the invitation and were screened in a telephone interview to ensure the couples met the following criteria, given broader goals of the study: (a) they had been married less than 4 months and both partners could attend a laboratory session within the first 4 months of their marriage (to ensure couples began the study at similar marital phases and to maxi-

mize marital changes over the course of the study), (b) neither partner had been previously married (to avoid carry-over effects from previous marriages), (c) they were at least 18 years of age, and (d) they spoke English (to ensure comprehension of the questionnaires). Of these, 159 couples did not meet the eligibility criteria. Although data collection was initially planned for 12 months, we extended it one additional month to increase our sample size. Of the 113 couples who participated in the broader longitudinal study, 7 couples failed to provide complete and usable data at baseline (4 wives [3.5%] failed to indicate whether they used HCs, 2 husbands [1.8%] did not complete the perceived partner commitment measure, and 1 husband [0.9%] did not complete the mate guarding and jealousy measure). Therefore, the final sample consisted of 106 husbands and wives (see Table 1 for sample descriptives; e.g., age, education, ethnic background, etc.).

Procedure

After recruitment, participants read and signed a consent form approved by the local review board and completed a battery of questionnaires online via Qualtrics.com or through the mail. Husbands' questionnaires included self-report measures of perceived partner commitment, mate guarding, jealousy, numerous covariates (marital satisfaction, anxious and avoidant attachment, age, race, income, and education), and additional measures beyond the scope of the current analyses. Wives' questionnaires included self-report measures assessing whether they were currently using HCs, numerous covariates (anxious and avoidant attachment, pregnancy, whether the couple was attempting to conceive, and the length of the relationship before marriage), and additional measures beyond the scope of the current analyses. To help maintain the privacy of their responses, we instructed all couples to complete their questionnaires independent of their spouses. We compensated couples \$100 for completing these questionnaires and participating in an on-campus laboratory session beyond the scope of the current analyses.

Measures

Wives' HC use. Wives reported whether they were currently using any form of HC (e.g., the pill, patch, vaginal ring, etc.). We dummy-

Table 1
Sample Descriptives

	Husbands (<i>N</i> = 106)		Wives (<i>N</i> = 106)	
	<i>M</i> (<i>SD</i>)	%	<i>M</i> (<i>SD</i>)	%
Age (in years)	28.16 (5.69)	—	26.82 (4.79)	—
Income (in thousands)	44.19 (47.93)	—	33.46 (36.64)	—
Education (in years)	15.31 (2.81)	—	15.71 (2.82)	—
Using hormonal contraceptives	—	—	—	47.1%
Full-time employment	—	69.8%	—	50.0%
Full-time student	—	13.2%	—	13.2%
Ethnicity				
Black	—	29.2%	—	25.5%
White	—	46.2%	—	48.1%
Latino/Latina	—	17.0%	—	17.0%
Other	—	6.6%	—	8.5%

Note. Relative to other samples of newlywed couples, this sample was quite diverse (see Karney, Kreitz, & Sweeney, 2004). One husband did not report his age; 7 husbands did not report their income; 1 wife and 1 husband did not report their ethnicity.

coded HC use such that 0 = *no HC use* ($n = 56$) and 1 = *HC use* ($n = 50$).

Husbands' perceived partner commitment.

We utilized a modified version of the Commitment Inventory (see Stanley & Markman, 1992) to measure husbands' perceptions of their wives' commitment. We modified items from the original scale, originally designed to assess individuals' own level of commitment to their relationships, to assess perceptions of their spouses' commitment (e.g., "My partner wants to grow old with me," and "My partner may not want to be with me a few years from now"). Husbands indicated the extent to which they agreed with 60 statements about their wives on a 7-point Likert scale ranging from 1 = *strongly disagree* to 7 = *strongly agree*. After reverse-scoring the necessary items, we averaged all items to form an index of husbands' perceived partner commitment ($\alpha = .93$).

Husbands' mate guarding and jealousy.

To assess husbands' mate guarding and jealous tendencies, husbands completed the 8-item behavioral and cognitive subscales of the Multi-dimensional Jealousy Scale (Pfeiffer & Wong, 1989).¹ The behavioral jealousy subscale assesses protective and detective behaviors aimed at reducing the likelihood of potential partner infidelity (i.e., mate-guarding behaviors)—many of the items on this subscale are similar to items on other commonly used mate guarding measures (see Buss, 1988; Shackelford, Goetz, & Buss, 2005). To assess mate guarding, hus-

bands indicated the frequency that they engaged in mate-guarding behaviors (e.g., "I say something nasty about someone of the opposite sex if [my spouse] shows an interest in that person," "I look through [my spouse's] drawers, handbag, or pockets") on a 7-point scale ranging from 1 = *never* to 7 = *all the time*. The cognitive jealousy subscale assesses worries or suspicions regarding specific partner infidelity. To assess cognitive jealousy, husbands indicated the frequency that they think or worry about their partners' interactions with the opposite sex (e.g., "I suspect that [my spouse] is secretly seeing someone of the opposite sex," "I am worried that someone of the opposite sex is trying to seduce [my spouse]") on a 7-point scale ranging from 1 = *never* to 7 = *all the time*. We averaged the eight items from each subscale to form indices of husbands' mate guarding ($\alpha = .90$) and cognitive jealousy ($\alpha = .93$).

Control variables. To ensure that any associations between husbands' perceived partner commitment, wives' HC use, and husbands'

¹ We also assessed the third subscale of the MJS, emotional jealousy, which assesses the extent to which men would respond if their partner were to engage in infidelity, rather than their actual relationship jealousy. We did not include it in the current study because it was not a relevant measure to our specific predictions. Nevertheless, a supplemental analysis revealed that this subscale was unassociated with the Perceived Commitment \times HC Use interaction, $b = -0.91$, $SE = 2.15$, $t(102) = -0.42$, $p = .672$.

behavioral jealousy did not arise because of other related factors, we assessed and controlled several covariates. First, we assessed husbands' age (one husband failed to report his age), race (one husband failed to report his race), income (via an open-ended question; seven husbands failed to report their income), and education, and controlled for each in supplemental analyses. Second, given that husbands' marital satisfaction is associated with their perceived partner commitment (e.g., Meltzer, McNulty, & Maner, 2016) and jealousy (e.g., Guerrero & Eloy, 1992), husbands completed two measures of marital satisfaction (the 6-item Quality Marriage Index; Norton, 1983; $\alpha = .92$) and a 15-item semantic differential (Osgood, Suci, & Tannenbaum, 1957; $\alpha = .95$; two husbands failed to complete the semantic differential). Given that the two measures were highly correlated ($r = .82$), we standardized and averaged husbands' scores from each measure to form a single index of husbands' marital satisfaction, and controlled for it in supplemental analyses. Third, given that pregnancy interrupts women's menstrual cycles (and thus likely also interrupts women's sexual-signaling behaviors), we assessed whether the wife was pregnant (we dummy-coded wives' pregnancy status such that 0 = *not pregnant* [$n = 94$] and 1 = *pregnant* [$n = 12$]), and controlled for it in supplemental analyses. Fourth, given that men may be hyper-vigilant to their partners' potential EPCs when couples are actively attempting to conceive, we assessed whether couples were attempting pregnancy (we dummy-coded couples' pregnancy attempts such that 0 = *not attempting pregnancy* [$n = 87$] and 1 = *attempting pregnancy* [$n = 8$]), and controlled for it in supplemental analyses. Fifth, although all couples were recruited within the first 4 months of marriage, relationship length before marriage may influence perceptions of partner commitment or mate guarding behaviors. Thus, we also assessed and controlled for relationship length. Finally, given that husbands' perceived partner commitment and jealousy could also be related to both their own and their wives' insecure attachment (Guerrero, 1998; Morgan & Shaver, 1999), couples completed a measure of insecure attachment (for anxiety, both husbands' and wives' $\alpha = .94$; for avoidance, both husbands' and wives' $\alpha = .93$; two wives failed to complete all items assessing avoidant attachment).

Although we excluded covariates in all primary analyses, we conducted a series of supplementary analyses that included (a) each covariate individually, and (b) all covariates simultaneously in one model to assess the robustness of the hypothesized effects.

Results

Descriptive Statistics and Preliminary Analyses

Descriptive statistics of and bivariate correlations between all primary variables and covariates are reported in Table 2. A few results are worth highlighting. First, husbands reported relatively low levels of mate guarding and jealousy on average. Second, husbands perceived relatively high levels of partner commitment on average and reported relatively high levels of marital satisfaction on average. Nevertheless, there is substantial variability in both husbands' perceptions of partner commitment and their marital satisfaction. Third, consistent with predictions, husbands' perceived partner commitment was negatively associated with both mate guarding and jealousy. Fourth, unsurprisingly, husbands' perceived partner commitment was positively associated with their marital satisfaction and negatively associated with both husbands' and wives' insecure attachment. Finally, consistent with research on romantic attachment and jealousy (e.g., Guerrero, 1998), husbands' mate guarding was positively associated with both husbands' and wives' anxious attachment but unassociated with both husbands' and wives' avoidant attachment.

Effects of Husbands' Perceived Partner Commitment and Wives' HC Use on Husbands' Mate Guarding and Jealousy

To test our first prediction that the association between husbands' perceived partner commitment and their mate guarding would depend on their wives' HC use, we regressed husbands' mate guarding onto the standardized score of husbands' perceived partner commitment, the dummy code of wives' HC use, and the Perceived Commitment \times HC Use interaction (syntax for this analysis is provided in the supplementary online materials). Results are reported in the top half of Table 3. As can be seen,

Table 2
Descriptive Statistics and Correlations of Husbands' (H) and Wives' (W) Covariates

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
(1) Perceived partner commitment (H)	—													
(2) Mate guarding (H)	-.39***	—												
(3) Jealousy (H)	-.49***	-.58***	—											
(4) Age (H)	-.09	-.06	-.06	—										
(5) Income (H)	.00	-.19	-.12	.07	—									
(6) Education (H)	.24*	-.26**	-.28**	.03	.42***	—								
(7) Marital satisfaction (H)	.49***	-.12	-.30**	-.22*	-.04	.11	—							
(8) Anxious attachment (H)	-.55***	.38***	.40***	.08	.04	-.13	-.45***	—						
(9) Avoidant attachment (H)	-.50***	.18	.25*	.28**	.13	.01	-.53***	.68***	—					
(10) Anxious attachment (W)	-.26**	.23*	.15	-.09	-.02	-.22*	-.21*	.18	.12	—				
(11) Avoidant attachment (W)	-.22*	.16	.21*	.03	.03	-.15	-.27**	.30**	.15	.51***	—			
(12) Pregnancy status (W)	-.02	-.06	-.12	-.21**	-.08	.11	-.03	-.16	-.11	.01	-.02	—		
(13) Attempting to conceive (W)	.08	-.14	-.19	.12	.19	.23*	.21*	.03	-.03	-.18	-.15	-.03	—	
(14) Relationship length (months)	-.14	-.02	-.04	-.07	-.10	-.12	.04	-.09	-.11	-.05	-.02	.12	.12	—
M	5.46	13.20	13.15	28.16	44.19k	15.31	—	41.67	40.76	44.16	42.63	1.88	1.91	42.11
SD	.73	7.55	8.71	5.69	47.93k	2.81	—	21.85	18.31	21.94	18.48	.33	.29	30.46

Note. N = 106. Because of their categorical nature, we did not include wives' hormonal contraceptive use and husbands' race. Additionally, given that marital satisfaction is a standardized aggregate of two measures (and thus, by definition, has a mean of 0 and a SD of 1), we did not report the aggregates' descriptive statistics. Nevertheless, husbands reported relatively high marital satisfaction (for the Quality Marriage Index, M = 41.17, SD = 5.13; for the semantic differential, M = 93.75, SD = 12.30).

* p < .05. ** p < .01. *** p < .001.

Table 3
Associations Between Husbands' Perceived Partner Commitment, Wives' Hormonal Contraceptive Use, and Husbands' Mate Guarding and Jealousy

	<i>b</i>	<i>SE</i>	<i>Effect size r</i>
DV: Mate guarding			
Intercept	12.85	.94	—
Perceived partner commitment (PC)	-4.57***	.89	.45
Hormonal contraceptive (HC) use	-.69	1.39	.05
PC × HC Use	4.32**	1.42	.29
DV: Jealousy			
Intercept	12.37	1.07	—
Perceived partner commitment (PC)	-4.56***	1.01	.41
Hormonal contraceptive (HC) use	1.64	1.57	.10
PC × HC Use	.05	1.61	.00

Note. For both analyses, $df = 102$. $Effect\ size\ r = \sqrt{\frac{r^2}{r^2 + df}}$.

** $p < .01$. *** $p < .001$.

consistent with predictions, wives' HC use moderated the association between husbands' perceived partner commitment and mate guarding.² This interaction is depicted in Figure 1.

We examined the nature of this interaction by estimating the simple effects of perceived partner commitment for husbands whose wives reported using and not using HCs. Whereas perceived partner commitment was negatively associated with mate guarding among husbands whose wives were not using HCs ($b = -4.57$, $SE = 0.89$, $t(102) = -5.13$, $p < .001$, *effect*

size r = .45), perceived partner commitment was unassociated with mate guarding among husbands whose wives used HCs ($b = -0.25$, $SE = 1.11$, $t(102) = -0.23$, $p = .821$). That is, the negative association between husbands' perceived partner commitment and mate guarding emerged only among husbands whose wives were not using HCs. Notably, a series of supplemental analyses demonstrated that the key Perceived Commitment × HC Use interaction (a) continued to emerge as significant when controlling for the standardized score of husbands' cognitive jealousy, $b = 4.30$, $SE = 1.23$, $t(101) = 3.49$, $p = .001$, *effect size r = .33*, and (b) emerged as marginally significant when controlling for husbands' age, husbands' race, husbands' income, husbands' education, husbands' marital satisfaction, wives' pregnancy status, whether the couple was attempting to conceive, the length of the relationship before the marriage, and husbands' and wives' insecure attachment (when each covariate was entered into the model separately, all $ps < .02$;

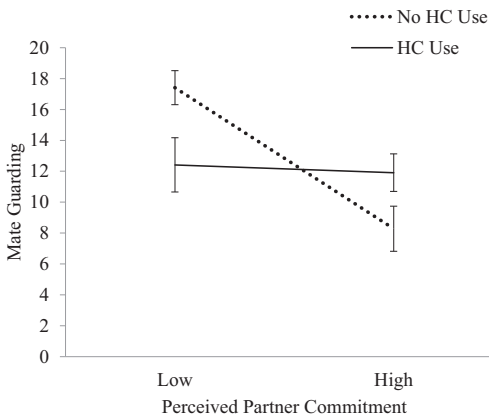


Figure 1. Interactive effect of husbands' perceived partner commitment and wives' hormonal contraceptive (HC) use on husbands' mate guarding.

² We conducted an additional supplemental analysis in which we imputed mean scores for husbands' missing perceived partner commitment and/or behavioral jealousy data. In that analysis, the Perceived Commitment × HC Use interaction continued to emerge as significant, $b = 4.03$, $SE = 1.39$, $t(112) = 2.89$, $p = .005$, *effect size r = .26*.

when all covariates were entered into the model simultaneously,³ $b = 2.85$, $SE = 1.48$, $t(51) = 1.93$ $p = .060$, *effect size* $r = .23$.

To test our second prediction that the association between husbands' perceived partner commitment and their cognitive jealousy would depend on their wives' HC use, we regressed husbands' cognitive jealousy onto the standardized score of husbands' perceived partner commitment, the dummy code of wives' HC use, and the Perceived Commitment \times HC Use interaction (syntax for this analysis is provided in the supplementary online material). Results are reported in the bottom half of Table 3. As can be seen, wives' HC use did not moderate the association between husbands' perceived partner commitment and cognitive jealousy. Rather, husbands' decreased perceptions of partner commitment were associated with increased jealousy, regardless of whether their wives used HCs.

Discussion

The current study tested the prediction that the association between men's perceived partner commitment and their mate guarding would be moderated by their partners' HC use. Consistent with predictions, perceived partner commitment was negatively associated with mate guarding among men whose wives reported not using HCs—possibly because those women were engaging in relatively higher levels of sexual signaling, especially around the fertile period of the menstrual cycle. In contrast, perceived partner commitment was unassociated with mate guarding among men whose wives reported using HCs—possibly because those women were engaging in relatively lower levels of sexual signaling. Notably, this effect appears to be robust given that it continued to emerge as significant when we controlled (a) husbands' jealousy, and (b) husbands' age, husbands' race, husbands' income, husbands' education, husbands' marital satisfaction, wives' pregnancy status, whether the couple was attempting to conceive, the length of the relationship before marriage, and husbands' and wives' insecure attachment. Interestingly, wives' HC use failed to moderate the negative association between husbands' perceived partner commitment and jealousy.

One possible explanation for why this interactive effect predicted men's mate guarding but failed to predict men's jealousy may be because of our measure of jealousy and the nature of our sample—newlywed couples. Whereas the behavioral jealousy subscale of the Multidimensional Jealousy Scale (i.e., mate guarding) seems to assess general low-level vigilance aimed at reducing the likelihood of potential future partner infidelity, the cognitive jealousy subscale seems to assess concerns regarding specific instances of perceived partner infidelity. Because these newlywed couples had all been married for less than 4 months, however, it is likely that few husbands in our sample experienced actual instances of perceived partner infidelity. Thus, future research may benefit from examining the extent to which women's HC use moderates the negative association between men's perceived partner commitment and jealousy in samples comprised of couples with higher levels of perceived partner infidelity (e.g., relationships in which infidelity has previously occurred). In such samples, we might observe a negative association between perceived partner commitment and jealousy among men with partners not using HCs and no association among men with partners using HCs.

Theoretical and Practical Implications

The current findings have several theoretical and practical implications. First, the current study highlights the importance of integrating proximate and ultimate perspectives to better understand long-term relationship processes. Consistent with evolutionary perspectives, because mate guarding functions to retain long-term mates and prevent sexual infidelity, ancestral men who appropriately mate guarded in response to warning signs of potential partner EPCs would have more successfully retained their mates and reduced the risk of cuckoldry

³ When all covariates were simultaneously included in the model, the p -values for each covariate were as follows: jealousy, $p < .001$; husbands' age, $p = .52$; husbands' race, $p = .29$; husbands' income, $p = .14$; husbands' education, $p = .85$; husbands' marital satisfaction, $p = .89$; pregnancy, $p = .74$; attempting to conceive, $p = .28$; relationship length, $p = .35$; husbands' attachment anxiety, $p = .80$; husbands' attachment avoidance, $p = .84$; wives' attachment anxiety, $p = .30$; wives' attachment avoidance, $p = .94$.

than ancestral men who failed to appropriately mate guard. And throughout human evolutionary history, the presence of sexual signaling likely sufficed as such a warning signal to ancestral men. However, as the current study demonstrates, aspects of the modern-day environment—specifically, the use of HCs—interrupt this evolved process because women who use HCs likely display less sexual-signaling behaviors. Future research may benefit from continuing to explore how HCs and other modern advancements (e.g., plastic surgery, fertility treatments) impact evolved mechanisms in the context of established relationships, relationship formation, and initial attraction.

Second, although prior research has demonstrated a negative association between perceived partner commitment and mate guarding, the current study demonstrates that this effect depends on women's HC use. It is possible, however, that women's HC use may be only one of a few potential moderators of this effect. For example, given that men's prenatal testosterone exposure (as measured by 2D:4D ratio) is associated with greater jealousy toward romantic rivals (Park, Wieling, Buunk, & Massar, 2008), and given that men's state testosterone varies as a function of women's fertility status (Miller & Maner, 2010), it is possible that women's fertility status moderates the association between men's perceived partner commitment and mate guarding through changes in men's testosterone levels. Indeed, men may behave more jealously near their partners' peak fertility than during less fertile phases of their partners' menstrual cycles because of increases in men's testosterone levels. Future research may benefit from exploring this and other potential factors that may underlie men's mate guarding.

Finally, the current findings also have an important practical implication. Specifically, these data add to the growing literature demonstrating that women's HC use affects both men's and women's relationship-oriented cognitions and behaviors (for a review, see Alvergne & Lummaa, 2010). For example, congruency in women's HC use at the start of their relationships and their current HC use predicts women's sexual satisfaction (Roberts et al., 2014) and decreased expressions of jealousy (Cobey, Roberts, & Buunk, 2013). Moreover, such congruency in women's HC use interacts with their partners' physical qualities (e.g., facial attrac-

tiveness) to predict women's relationship satisfaction (Russell, McNulty, Baker, & Meltzer, 2014). In the current study, we demonstrated that women's HC use interrupted the negative association between men's perceived partner commitment and mate guarding. This finding suggests that women's behaviors that alert their partners to the potential for sexual infidelity—such as sexual signaling—are unknowingly suppressed by HCs. Thus, it is plausible that men may be less likely to perceive a risk for partner sexual infidelity when those partners use HCs—even if they should have reason to perceive such a risk. This could be particularly detrimental for men's relationships given that sexual infidelity is associated with a number of costs such as relationship conflict (Daly et al., 1982) and dissolution (Betzig, 1989). Additionally, given that women's extra-pair desires fluctuate across their menstrual cycles (Pillsworth & Haselton, 2006), women not using HCs may be more likely to engage in EPCs. Future research may benefit from continuing to explore the impact that HCs have on both pre-marital and marital relationships.

Study Strengths and Limitations

Several strengths of the current research enhance our confidence in the results reported here. First, our sample was comprised of newly married couples drawn from the community, whereas prior research has often utilized samples of hypothetical and dating couples drawn from a college population (e.g., Elphinston, Feeney, & Noller, 2011; Russell & Harton, 2005; for exceptions, see Henning & Connor-Smith, 2011; Holtzworth-Munroe, Meehan, Herron, Rehman, & Stuart, 2000). Thus, the present research improves our understanding of factors that influence jealousy among spouses—an important population to study given that most people will enter into at least one marriage during their lifetime. Second, because participants in the current study responded based on their actual intimate relationships, rather than hypothetical, laboratory-based, or prior relationships, the processes and outcomes we measured were both real and consequential. Finally, the key interactive effect predicting men's mate guarding held controlling for several potential confounds, thus decreasing the possibility that

the results were spurious because of associations with those variables.

Despite these strengths, several factors limit interpretations of the current findings until they can be replicated and extended. First, given the cross-sectional nature of our study, we are unable to draw causal conclusions. Although we were able to control numerous variables that could have been responsible for the pattern of findings observed here, it is possible that the effects emerged in part because of unmeasured third variables. Thus, future research may benefit from utilizing longitudinal or experimental methodologies.

Second, although we utilized women's HC use as a proxy of their sexual signaling, we never directly assessed women's sexual signaling behaviors. The extant literature suggests that HCs suppress women's sexual signaling (Alvergne & Lummaa, 2010), and sexual signaling when paired with low partner commitment should theoretically signal high risk for partner sexual infidelity. Nevertheless, future research may benefit from directly examining the extent to which women's sexual signaling mediates the association between men's perceptions of low partner commitment and their behavioral jealousy.

Third, while the potential costs of infidelity (e.g., cuckoldry) are likely to be higher among men whose partners are not using HCs, we did not have a valid measure of women's fertility in the current study.⁴ An even stronger test of our hypotheses may be to examine the extent to which the association between perceived partner commitment, women's HC use, and men's mate guarding is further moderated by women's fertility status. Indeed, the negative association between perceived partner commitment and mate guarding that emerged here among men with partners not using HCs may be particularly strong near their partners' peak fertility.

Fourth, we did not examine whether variability across different forms of HCs influences the pattern of results demonstrated here. Although recent evidence demonstrates a positive association between the use of HCs with synthetic estrogen and women's mate retention and jealousy (Cobey, Pollet, Roberts, & Buunk, 2011), the association between different forms of HCs and men's mate guarding and jealousy remains less clear. Accordingly, future research may benefit from examining the extent to which the

effects demonstrated here are moderated by different forms of HCs.

Finally, whereas the homogeneity of this sample enhances our confidence in the pattern of associations that emerged here, this homogeneity limits our ability to generalize these findings to other samples. Additional research may benefit from attempting to replicate our primary effect in other populations of long-term couples (e.g., cohabiting unmarried couples, couples married longer than 4 months).

Conclusion

Men's mate guarding, in the context of a long-term romantic relationship, is likely an adaptive response to the threat of potential partner sexual infidelity. However, as the current research demonstrates, modern-day advancements (e.g., HCs) can interrupt this process. Indeed, men whose partners use HCs failed to respond to perceptions of low partner commitment with increased mate guarding, possibly because their partners displayed relatively lower levels of sexual signaling. This finding joins a growing body of research showing that HCs impact people's romantic relationships in numerous ways, and it is our hope that this research will ignite further inquiry as to how HCs affect the operation of evolved mating mechanisms.

⁴ Although Meltzer (2016) utilizes the same sample of 113 first-married newlywed couples, the data utilized in each article are drawn from different phases of the broader longitudinal study. Whereas the current article utilizes data from the baseline phase, Meltzer utilizes data from the daily-diary phase. During the baseline phase, husbands and wives were permitted several weeks to complete their packet of questionnaires and they often completed their packets on different days and/or weeks. Consequently, given that estimates of wives' fertility are time sensitive (i.e., they fluctuate day-to-day), we were unable to estimate wives' fertility on the days that husbands completed their relevant measures. In contrast, during the daily-diary phase of the longitudinal study, husbands and wives completed all relevant measures on the same days (across 14 subsequent days) and thus Meltzer (2016) was able to estimate wives' fertility each day of the 14-day daily diary phase of the study.

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