

Male Mate Retention Behaviors Vary with Risk of Partner Infidelity and Sperm Competition

Valerie G. Starratt, Todd K. Shackelford, Aaron T. Goetz, and William F. McKibbin

Florida Atlantic University

Sperm competition occurs when the sperm of two or more males concurrently occupy the reproductive tract of a single female and compete to fertilize an egg. This can be costly if the woman's social partner loses the competition and, as a consequence, invests in offspring that are not genetically his own, a situation known as cuckoldry. Previous research suggests that men may have evolved tactics such as mate retention behaviors that reduce the risk of sperm competition and cuckoldry. The current research provides new evidence that men at greater risk of partner infidelity and sperm competition, measured as having spent a greater proportion of time apart from their partner since the couple's last in-pair copulation, more frequently perform a variety of mate retention behaviors, such as calling unexpectedly to check up on their partners, monopolizing their partners' time when around other men, and threatening other men who show an interest in their partners.

Keywords: mate retention, female infidelity, sperm competition, evolutionary psychology.

男性监控配偶、配偶不贞与精子竞争的关系

精子竞争是指同一女性产道中两个或两个以上男人的精子相互竞争卵子的过程。女性得到社会承认的性伙伴可能因精子竞争失败而损失惨重，因为女性私通可能引起男性投资于不携带自己基因的后代。过去研究表明进化而来的男性配偶监控策略可以防止女性不贞，减少精子竞争失败的危险。当前研究发现男性与配偶进行性行为后离别时间越久，男性就越采取出其不意地打电话、独占配偶时间、威胁对配偶感兴趣的男性等手段来监控配偶。

关键词：配偶监护，女性不忠，精子竞争，进化心理学。

分类号：B84-069

Over human evolutionary history, ancestral men and women faced many recurrent adaptive problems that hindered survival or reproduction. One of these classes of adaptive problems are those associated with sperm competition, which have been studied extensively in non-human animals but only recently in humans (see, for review, Platek & Shackelford, 2006; Shackelford, & Goetz, in press; Shackelford & Goetz, 2006; Shackelford & Pound, 2006; Shackelford, Pound, & Goetz, 2005). Sperm competition occurs when the sperm of two or more males concurrently occupy the reproductive tract of a single female and compete to fertilize an egg. This can be costly for a mated male who loses the competition to a rival male and consequently may unwittingly invest in offspring that are not genetically his own. This investment of time, energy, and resources into genetically unrelated offspring—known as cuckoldry—is reproductively costly. By investing in another male's offspring, the cuckolded male is not only contributing to the replication of another man's genes, but also is left

with fewer resources to invest in potential future offspring of his own.

Because cuckoldry was a costly and recurrent adaptive problem during human evolutionary history, those males who successfully avoided cuckoldry almost certainly have out-reproduced those who did not. Consequently, men today are hypothesized to have psychological mechanisms that motivate anti-cuckoldry behaviors. Previous research has supported this hypothesis. For example, men at a greater risk of sperm competition and cuckoldry report their partner to be more attractive, report that other men find their partner more attractive, report that they are more interested in copulating with their partner, and report that their partner is more sexually interested in them (Shackelford, LeBlanc, Weekes-Shackelford, Bleske-Rechek, Euler, & Hoier, 2002). These effects are independent of men's relationship satisfaction, total time since last in-pair copulation, and total time spent apart since last in-pair copulation, which rules out several alternative explanations (such as being "sexually frustrated"). More recently, Shackelford, Goetz, McKibbin, and Starratt (2006) documented that men who spent a greater (relative to men who spend a lesser) proportion of time apart from their partner since the couple's last copulation reported

Received 2007-01-31

Correspondence should be addressed to Valerie G. Starratt, Department of Psychology, Florida Atlantic University, 2912 College Avenue, Davie, FL 33314, USA; e-mail: vstarrat@fau.edu.

greater sexual interest in their partner, greater distress in response to their partner's sexual rejection, and greater sexual persistence in response to this rejection. Again, these effects are independent of total time since the couple's last copulation and the man's relationship satisfaction. These perceptual changes (i.e., increased sexual interest and greater distress and persistence following sexual rejection) may motivate men to copulate as soon as possible with their partner, thereby entering their sperm into competition with any rival sperm that may be present in his partner's reproductive tract.

Mate retention behaviors also have been proposed as a class of anti-cuckoldry tactic. Mate retention behaviors in humans have been assessed with reliability and validity by the Mate Retention Inventory (MRI; Buss, 1988; Shackelford, Goetz, & Buss, 2005). The MRI assesses behaviors ranging from, "I bought my partner a bouquet of flowers," to "I hit my partner when I caught her flirting with someone else." These behaviors may function to fend off rivals or to prevent a partner's infidelity or desertion from the relationship (Buss & Shackelford, 1997). Men guard and attempt to retain their mates more intensely when mated to women who are more likely to engage in extra-pair copulations (Goetz et al., 2005) and when the perceived probability of her engaging in extra-pair copulations is higher (Buss & Shackelford, 1997). Thus, men appear to be more likely to perform mate retention behaviors when there is a greater risk of partner infidelity.

Not all instances of female infidelity are associated with sperm competition; for sperm competition to occur, a woman must copulate with at least two men in a sufficiently short period of time (estimates range from three days to 13 days; Baker & Bellis, 1995; Shackelford, Pound, & Goetz, 2005; Smith, 1984) when she is at or near the fertile phase of her ovulatory cycle. Because men are not usually privy to their partner's fertility status or extra-pair copulatory behavior, they must rely on available information – cues to the risk of female infidelity. In the current study, the proportion of time spent apart since the couple's last copulation provides an assay of the risk of female infidelity, a proxy for the risk of sperm competition and subsequent cuckoldry. Given the relationship between female infidelity and sperm competition, and in an attempt to maintain consistency with previous literature, we refer to the risk of sperm competition as short-hand for the risk of partner infidelity and associated risks of sperm competition and cuckoldry.

The current research investigates the relationships between male mate retention behaviors and the risk of sperm competition. Following previous research (e.g., Baker & Bellis, 1995; Shackelford et al., 2002, 2006), we operationalized risk of sperm competition as the

proportion of time a couple has spent apart since their last in-pair copulation. As this proportion increases, the risk that a rival male will inseminate a woman increases (Baker & Bellis, 1995). Consequently, we hypothesize positive relationships between men's mate retention behaviors and the proportion of time a couple has spent apart since their last in-pair copulation. An alternative hypothesis is that men's mate retention is related to the *total time* since last in-pair copulation, such that mate retention effort increases with time since last copulation, perhaps as a result of increasing "sexual frustration" (see Shackelford et al., 2002, 2006). We do not anticipate support for this alternative hypothesis. Because it is a direct assessment of the risk of sperm competition, the proportion of time spent apart since last in-pair copulation is hypothesized to be related to men's mate retention behaviors. The total time since last in-pair copulation, in contrast, is not related to the risk of sperm competition and, therefore, men's mate retention behaviors are not expected to be related to the total time since last in-pair copulation.

Methods

Participants. Two hundred sixty-six men, each in a committed, heterosexual, sexual relationship of at least one year, participated in this study. The mean age of participants was 24.9 years ($SD = 7.3$). The mean age of the participants' partners was 23.7 years ($SD = 6.6$). The mean relationship length was 44.6 months ($SD = 49.7$).

Materials. Participants first completed a demographic questionnaire that secured information including the participant's age, his partner's age, and the length of the current relationship. This questionnaire also secured information about the last time the participant had sexual intercourse with his partner and the amount of time since last sexual intercourse (including sleeping time) the participant spent with his partner, following Shackelford et al. (2002, 2006).

Participants also completed the MRI (Buss, 1988; Shackelford, Goetz, & Buss, 2005), a self-report inventory assessing the occurrence of 104 mate retention behaviors during the past month. The MRI assesses behaviors using an ordered-category scale with responses from 0 = *Never performed this act* to 3 = *Often performed this act*. Buss (1988; and see Buss & Shackelford, 1997) organized the 104 *acts* into 19 different mate retention *tactics*, which are then further organized into five mate retention *categories*. These categories (and corresponding example tactics) are: Direct Guarding (Concealment of Mate, Monopolization of Time), Intersexual Negative Inducements (Punish Mate's Infidelity Threat, Emotional Manipulation), Positive Inducements (Sexual Inducements, Appearance Enhancement),

Public Signals of Possession (Verbal Possession Signals, Physical Possession Signals), and Intrasexual Negative Inducements (Derogation of Mate, Violence Against Rivals). Previous research provides evidence of the reliability and validity of the MRI (e.g., Buss, 1988; Shackelford, Goetz, & Buss, 2005). Internal consistency reliability estimates of the five mate retention categories ranged from .83 to .92 with an average of .86 and, for the 19 mate retention tactics, they ranged from .86 to .41 with an average of .72. Summing all the items to form one single score yielded an internal consistency estimate of .97.

Procedure. Three criteria must have been met to qualify for participation: the prospective participant must be (1) male, (2) at least 18 years of age, and (3) currently involved in a committed, heterosexual

relationship. Upon the prospective participant's arrival at the scheduled time and location, the researcher confirmed that the prospective participant met these criteria. If the criteria were met, the researcher provided the participant with a consent form, the survey, and a security envelope. The participant was instructed to read and sign the consent form, complete the survey, place the completed survey in the envelope, and then seal the envelope. The participant was instructed not to seal the consent form inside the envelope to maintain anonymity. Upon completion of the survey, the researcher explained to the participant the purpose of the study, answered any questions, and thanked the participant for his participation.

Table 1 *Correlations between Male Mate Retention Behaviors with Proportion of Time Apart Since Couple's Last In-Pair Copulation and Total Time Since Couple's Last In-Pair Copulation*

Retention	Time Apart Since Last Copulation	Total Time Since Last Copulation	Test of Difference Male Mate (z -value)
Direct Guarding	.21***	-.02	2.61**
Vigilance	.20**	-.02	2.40*
Concealment of Mate	.21***	-.01	2.42*
Monopolization of Time	.16*	-.03	2.07*
Intersexual Negative Inducements	.23***	.03	2.29*
Jealousy Induction	.13**	-.06	2.57**
Punish Mate's Infidelity Threat	.28***	.02	3.00**
Emotional Manipulation	.19**	.06	1.55
Commitment Manipulation	.13*	.09	0.50
Derogation of Competitors	.13*	.01	1.33
Positive Inducements	.14*	.01	1.48
Resource Display	.09	.07	0.22
Sexual Inducements	.22***	.01	2.30*
Appearance Enhancement	.14*	-.01	1.61
Love and Care	.02	-.06	0.84
Submission and Debasement	.09	-.02	1.26
Public Signals of Possession	.02	-.05	0.83
Verbal Possession Signals	.09	-.03	1.27
Physical Possession Signals	-.05	-.08	0.30
Possessive Ornamentation	.03	-.02	0.47
Intrasexual Negative Inducements	.19**	.03	1.79
Derogation of Mate	.13*	.09	0.55
Intrasexual Threats	.18**	.02	1.79
Violence Against Rivals	.14*	-.03	1.80
Men's Overall Mate Retention	.19**	.00	2.16*

* $p < .05$, ** $p < .01$, *** $p < .001$

Results

The proportion of time the couple had spent apart since their last in-pair copulation was calculated by subtracting the number of hours the couple had spent together since their last copulation from the total number of hours since the couple's last copulation and dividing this difference by the total number of hours since the couple's last copulation (following Shackelford et al., 2002, 2006). We then conducted correlations to identify relationships between men's mate retention behaviors and the risk of sperm competition as measured by the proportion of time the couple spent apart since their last in-pair copulation (see left-most column of Table 1).

Men's overall mate retention (sum of 104 items) was positively and significantly correlated with the proportion of time spent apart since the couple's last in-pair copulation ($r = .19$, $p < .05$). We also correlated each of the five mate retention categories with the proportion of time spent apart since last in-pair copulation. Four of the five correlations were positive and statistically significant at $p < .05$ ($r = .21$ for Direct Guarding, .23 for Intersexual Negative Inducements, .14 for Positive Inducements, and .19 for Intrasexual Negative Inducements). Finally, we correlated scores on each of the 19 mate retention tactics with the proportion of time spent apart since last in-pair copulation. Thirteen of the 19 correlations were positive and significant at $p < .05$. These

included all of the tactics in the Direct Guarding (average $r = .19$), Intersexual Negative Inducements (average $r = .17$), and Intrasexual Negative Inducements (average $r = .15$) categories and two of the five tactics in the Positive Inducements category (Sexual Inducements, $r = .22$ and Appearance Enhancement, $r = .14$).

Men's mate retention behaviors were unrelated to the *total time* since last in-pair copulation; the correlation between men's overall mate retention and total time since last in-pair copulation was not significant, $r = .001$ ($p > .05$). We also correlated scores on each of the five mate retention categories and 19 tactics with the total time since last in-pair copulation. None of these correlations was significant (see middle column of Table 1). To identify differences between the two sets of correlations, we performed Fisher's r -to- z transformations and the associated tests of differences in z -values (Cohen & Cohen, 1983). Nine of the correlations between mate retention scores and proportion of time spent apart since last in-pair copulation were significantly different ($p < .05$) from the parallel correlations between mate retention scores and the total time since last in-pair copulation (see right-most column of Table 1).

Discussion

Men's overall mate retention behavior was positively and significantly correlated with the proportion of time spent apart since the couple's last in-pair copulation, and thus with risk of female sexual infidelity and sperm competition. Scores on four of the five mate retention categories also were positively and significantly correlated with the risk of sperm competition. The mate retention tactics with the largest correlations with sperm competition risk were Punish Mate's Infidelity Threat ($r = .28$) and Sexual Inducements ($r = .22$). Punish Mate's Infidelity Threat includes acts such as, "Yelled at my partner after she showed interest in another man," and "Hit my partner when I caught her flirting with someone else." Sexual Inducements includes acts such as, "Performed sexual favors to keep my partner around," and "Gave in to sexual pressure to keep my partner." The mate retention tactics most strongly related to the risk of sperm competition thus include behaviors centered on the use of in-pair sex and punishment of a partner's interest in extra-pair sex, both of which may function as anti-cuckoldry tactics (see Goetz & Shackelford, 2006; Shackelford, Goetz, Buss, Euler, & Hoier, 2005; Shackelford, Goetz, Guta, & Schmitt, 2006).

Total time since last in-pair copulation was not significantly correlated with the performance of mate retention behaviors. In addition, nine of the significant correlations between mate retention behaviors and the

proportion of time spent apart since last in-pair copulations were significantly larger than the parallel correlations between mate retention behaviors and the total time since last in-pair copulation. These results indicate that it is not the total time since last in-pair copulation that predicts men's mate retention behaviors, but instead it is the proportion of time spent *apart* since the couple's last in-pair copulation that is important. In other words, men are not performing mate retention behaviors as a result of general "sexual frustration," but instead (according to the current argument) in response to the increased risk of sperm competition and cuckoldry.

A limitation of the current study is in its design. We present correlational analyses that prevent strong statements about causal relationships. We hypothesized that men's mate retention behaviors are a response to an increased risk of sperm competition and cuckoldry, as assessed by the proportion of time spent apart since the couple's last copulation. Although the results are consistent with this hypothesis, we cannot rule out the possibility that men's mate retention behaviors cause women to spend less time together with their partners since the couple's last copulation. A methodology that includes repeated assessments of the key variables over time would allow for the identification of causal relationships. Inclusion of variables assessing the activities of individuals when apart from their partners (e.g. "at work" vs. "out drinking") also might provide insight into the relationship between men's mate retention behaviors and the risk of sperm competition. Circumstances surrounding different situations are likely to include differential risks of sperm competition. For example, a woman who is away from her partner and at work may not have the same opportunities for extra-pair copulation as a woman who is away from her partner and at a bar. Accordingly, a man who believes that his partner is at work may not perform the same mate retention behaviors and with the same intensity and frequency as a man who believes that his partner is out drinking.

The current data include a one-time measure of current risk of sperm competition which we treat as a proxy for recent risk of sperm competition. It is reasonable to assume that the one-time measure of proportion of time spent apart since last in-pair copulation accurately reflects typical recent proportions of time spent apart since last in-pair copulation. Analyses of data from an independent study corroborate this assumption: Shackelford (2006) collected daily assessments of proportion of time spent apart from partner since the last in-pair copulation from 45 married men over a one-month period. Correlations between adjacent days for this variable are uniformly positive and significant (all ps

< .05), with an average cross-day correlation of $r = 0.61$.

In summary, this research tested the hypothesis that men's mate retention behavior is related positively to sperm competition risk as assessed by the proportion of time spent apart since the couple's last in-pair copulation. The results supported the hypothesis: Men who spend a greater proportion of time apart from their partner since the couple's last in-pair copulation report more frequent performance of a range of mate retention behaviors than do men who spend a greater proportion of time together with their partner since the couple's last in-pair copulation.

These findings contribute to the existing literature in several ways. Most broadly, this research provides evidence of the heuristic value of an evolutionary psychological perspective in generating empirically testable hypotheses about human psychology and behavior. In addition, the current research provides evidence of the ability of an evolutionary perspective (in this case, informed by sperm competition theory) to account parsimoniously for results that are difficult to explain from a mainstream standard social science model (cf. Tooby & Cosmides, 1992).

More specifically, the current results (1) add to the growing empirical and theoretical literatures indicating that men have evolved psychological mechanisms that function to address the adaptive problems of a partner's sexual infidelity and subsequent cuckoldry, and (2) offer a plausible explanation for the existence of these behaviors and the psychological mechanisms that motivate these behaviors. It is important to know not only *that* people behave as they do, but also *why* they do so. This research attempts to serve that function by providing empirical evidence that men who spend a greater proportion of time apart from their partners since the couple's last in-pair copulation are more likely to engage in a variety of mate retention behaviors, and that this may be because these men are at a greater risk of female sexual infidelity, sperm competition and subsequent cuckoldry.

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