

# Sex Begets Violence: Mating Motives, Social Dominance, and Physical Aggression in Men

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There are sizable gender differences in aggressive behavior, with men displaying a much higher propensity for violence than women. Evolutionary theories suggest that men's more violent nature derives in part from their historically greater need to compete over access to potential mates. The current research investigates this link between mating and male violence and provides rigorous experimental evidence that mating motives cause men to behave violently toward other men. In these studies, men and women were primed with a mating motive and then performed a noise-blast aggression task. Being primed with mating led men, but not women, to deliver more painful blasts of white noise to a same-sex partner (but not an opposite-sex partner). This effect was particularly pronounced among men with an unrestricted sociosexual orientation, for whom competition over access to new mates is an especially relevant concern. Findings also suggest that mating-induced male violence is motivated by a desire to assert one's dominance over other men: when men were given feedback that they had won a competition with their partner (and thus had achieved dominance through nonaggressive means), the effect of the mating prime on aggression was eliminated. These findings provide insight into the motivational roots of male aggression and illustrate the value of testing theories from evolutionary biology with rigorous experimental methods.

**Keywords:** aggression, mating, motivation, evolutionary psychology

Why do giraffes have long necks? Historically, scientists thought the giraffe's long neck was produced through evolution to help with foraging—a long neck helps the giraffe reach food high in the treetops (du Toit, 1990). As it turns out, this is only part of the story, because the giraffe's long neck is good for more than foraging. It is also good for fighting with other giraffes. Male giraffes often use their necks to engage in the (aptly named) behavior of *necking*—they use their necks as weapons to establish dominance over other males. Males who win these contests tend to enjoy greater access to female giraffes during mating (Simmons & Scheepers, 1996).

Human males do not have long necks like giraffes, but they do fight with one another in many other ways. Indeed, across virtually all cultures and historical time periods, men have displayed a propensity for behaving violently toward other men, and this propensity is far more pronounced than any such behavior in women (Archer, 2004; Daly & Wilson, 1988). Evolutionary theories suggest that this gender difference can be explained, at least in part, by differences between men's and women's reproductive strategies (Buss & Schmitt, 1993; Daly & Wilson, 1983; Kenrick & Sheets, 1993).

Although evolutionary theories provide a compelling view of male aggression, few experimental studies have tested the link between mating-related motives and violent behavior in men. Previous evolutionarily inspired studies of male violence have focused on men's general propensity for aggressiveness and have relied primarily on archival data and correlational methods (e.g., Wilson & Daly, 1985). The current research provides rigorous experimental tests of the hypothesis that proximate mating motives cause men to behave aggressively. Moreover, the current research directly examines the role of social dominance—a key link in the chain connecting mating motives to aggressive behavior. These studies test a theory from evolutionary psychology that has yet to undergo rigorous experimental verification.

## Sexual Selection and Male Violence

Theories of sexual selection (Darwin, 1871) and differential parental investment (Trivers, 1972) provide a basis for understanding an array of sex-differentiated behaviors. These theories suggest that, within a given species, the sex with lower levels of minimum obligatory parental investment must compete more for access to mates. Consequently, that sex will display higher levels of intrasexual competition and will experience greater pressure to display behaviors (including aggression) aimed at successfully procuring a mate.<sup>1</sup>

In humans, men have lower minimum obligatory levels of parental investment than women who, unlike men, experience

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<sup>1</sup> Theories of aggression differentiate between direct aggression (e.g., face-to-face confrontation) and indirect aggression (e.g., speaking badly about someone behind his or her back). The current research focuses specifically on direct aggression.

pregnancy and childbirth. Women's relatively higher level of obligatory parental investment limits men's access to mates by skewing the operational sex ratio, which represents the proportion of fertile females to sexually active males (Glutton-Brock & Vincent, 1991). Due to the length of pregnancy and women's limited lifetime reproductive capacity, the number of men motivated to find sexual partners typically far exceeds the number of fertile women. Men's reproductive access is further limited by women's high mating standards. Because women are obliged to invest heavily in their offspring, they tend to be more selective than men when choosing mates (Buss & Schmitt, 1993). Women's high mating standards cause men to compete with one another over access to mating opportunities (Geary, 1998).

The males of many species use a repertoire of strategies—including violence—to compete with other males, thereby increasing their access to mating opportunities (Archer, 2009). Like other sexually selected traits, aggression is theorized to have been sexually selected through both intrasexual competition and intersexual selection. Men use aggression to compete directly with other men and to limit other men's access to mates (i.e., intrasexual competition). Men also use aggression to signal qualities that are desired by the opposite sex (i.e., intersexual selection). Although aggression is not a behavior that women necessarily find attractive on its own, men use aggression to increase their level of social dominance, a characteristic upon which women tend to place a premium (Buss, 1988; Li, Bailey, Kenrick, & Linsenmeier, 2002; Sadalla, Kenrick, & Vershure, 1987; Schmitt & Buss, 1996). Across many societies, women tend to be attracted to socially dominant men (Buss, 1988; Li & Kenrick, 2006; Maner, DeWall, & Gailliot, 2008; Turke & Betzig, 1985) and socially dominant men tend to achieve relatively high levels of reproductive success (Betzig, 1986, 1992).

Theories from evolutionary psychology suggest that men's historical need to compete with other men over access to mates causes them to be more violent than women, in general. However, contemporary evolutionary psychological research also suggests that although humans are equipped with mechanisms designed to enhance their reproductive success, those mechanisms become operative particularly in situations that activate proximate mating motives (e.g., Maner, Gailliot, Rouby, & Miller, 2007; Maner, Miller, Rouby, & Gailliot, 2009). Thus, there is reason to expect that violence among men may be most prevalent when proximate mating motives are active. Indeed, among many animal species, male aggression reaches its zenith during mating season (Archer, 2006), a time when mating motives are presumably most salient.

Because aggression is theorized ultimately to serve mating-related functions, we hypothesized that activating a mating motive would increase men's tendency to behave aggressively toward other men. Existing experimental evidence for this hypothesis is limited. To date, the most compelling experimental study demonstrating the effect of mating motives on aggression was reported by Griskevicius et al. (2009). Our research differs from their work in a number of important respects. First, Griskevicius et al. focused on the self-presentational functions of mating-induced aggression—they reported an experiment suggesting that activation of a mating motive led men to display aggression, but only in the presence of a male audience. From an evolutionary perspective, mating-induced aggression in humans and other species is de-

signed not only to help males self-present; it serves as a means through which males directly dominate one another, regardless of who is watching. Thus, our research examines mating-induced aggression in the absence of self-presentational concerns and focuses more squarely on the hypothesis that the desire to assert one's dominance underlies mating-induced male aggression. Second, their research focused on aggressive responses to an explicit insult (e.g., when someone spills a drink on you and fails to apologize), whereas our research does not rely on insults to trigger violent behavior. Our work focuses on the more general hypothesis that mating motives lead men to adopt a fundamentally aggressive stance toward other men, even in the absence of an audience or insulting provocation. Third, whereas Griskevicius et al.'s experiment examined men's self-reported willingness to act aggressively in a hypothetical situation, we examine actual aggressive behavior. Although examining self-reported willingness to engage in hypothetical aggression reflects a valuable step, classic research on the intention-behavior gap shows that self-reports do not necessarily translate into actual behavior (e.g., Fishbein & Ajzen, 1975), especially when that behavior causes physical pain or carries the cost of potential retaliation (see Baumeister, Vohs, & Funder, 2007). Indeed, in the context of risky behaviors that occur in the heat of the moment, self-reported behavioral intentions often only weakly predict actual behavior (Sheeran, Abraham, & Orbell, 1999). The current work is the first to examine effects of mating motives on aggressive behavior.

### Dominance Striving and Male Aggression

A commonly used definition of aggression states that it is a behavior intended to harm another individual (Archer, 2009). This definition is useful for classifying aggression when it occurs, but it is mute to the motivational bases of aggression. From a functionalist perspective, aggression in the context of mating is not only intended to harm another person, it is intended to harm specific others (same-sex romantic competitors) for specific reasons (see Griskevicius et al., 2009). These reasons include subordinating competitors to increase one's level of social dominance. This perspective suggests that mating-induced male aggression is not an end in itself, but rather a means to attaining social dominance. That is, aggression is thought to promote reproductive success because it increases a man's dominance over other men. Indeed, several experiments have demonstrated that priming mating goals activates concepts related to status (Griskevicius et al., 2007; Roney, 2003; Wilson & Daly, 2004).

Although aggression can help men increase their level of social dominance, aggressive behavior also diverts energy from the pursuit of other goals and can lead to injury or death (Daly & Wilson, 1988). These costs imply that men should engage in aggression selectively. Because aggression is theorized to bolster reproductive success in part by increasing men's social dominance, we hypothesized that mating motives would lead men to aggress against a competitor primarily when their social dominance is at stake. More specifically, we predicted that men primed with mating would show increases in aggression toward other men only when no other, less costly ways of achieving dominance are readily available (cf. Wilson & Daly, 1985).

### The Role of Short-Term Mating

Evolutionary theories suggest that mating-induced male aggression may depend on individual differences in men's orientation toward short-term mating versus long-term mating (see Simpson & Gangestad, 1991). If the ultimate function of aggression is to increase access to mates, we hypothesized that the use of aggression would be observed primarily among men displaying a short-term mating strategy. Access to mates may be a more chronic reproductive constraint for men pursuing short-term sexual relationships because such men seek multiple partners rather than committing to one mate for an extended period. To increase access to mates, men with a preference for short-term mating may be especially likely to use aggression to display social dominance. Indeed, displays of dominance have been shown to serve short-term mating goals, in particular (Sundie et al., 2011), and men pursuing a short-term strategy tend to engage in more direct intrasexual competition tactics than men pursuing a long-term strategy (Simpson, Gangestad, Christensen, & Leck, 1999). Such findings are consistent with evidence that women prefer dominant men primarily in the context of short-term mating (Gangestad, Simpson, Cousins, Garver-Apgar, & Christenson, 2004; Snyder, Kirkpatrick, & Barrett, 2008). We therefore predicted that mating primes would increase aggression more strongly in men pursuing a short-term mating strategy, relative to a long-term mating strategy.

### The Current Research

The current research tested the overarching hypothesis that mating motives elicit aggressive behavior in men. Across three experiments, we manipulated mating motives and measured aggression toward a same-sex partner using a noise-blast paradigm. Based on evolutionary theories of intrasexual competition, we predicted that the mating primes would increase aggressive behavior in men. Because aggression does not serve the same mating-related functions for women, we anticipated no effects of the mating primes among women.

In addition to the moderating effect of participant gender, we examined three additional moderating variables in these studies. These moderating variables were intended not only to identify theoretically meaningful boundary conditions but also to provide further evidence of the mating-related functions of aggressive behavior. First, we examined the moderating role of social dominance. Our theoretical framework implies that dominance-striving underlies mating-related aggressive behavior in men. Therefore, if men are able to achieve social dominance in some other (less provocative) way, one would expect the effects of mating motives on aggression to be weakened or eliminated. We tested this hypothesis in Experiment 2.

In Experiment 3, we examined two additional moderating variables. First, we examined individual differences in men's orientation toward short-term versus long-term mating (i.e., sociosexual orientation; Gangestad & Simpson, 1990; Simpson & Gangestad, 1991). We expected that mating primes would increase aggressive behavior more strongly in men pursuing a short-term than a long-term mating strategy. Second, our framework implies that mating-induced aggression is designed to achieve dominance over other *men* (i.e., intrasexual competition). One would not expect mating motives to increase men's aggression toward women.

Therefore, in Experiment 3, we also manipulated the gender of the target person. We predicted that the mating prime would increase men's aggression toward another man, but not a woman.

### Experiment 1

Experiment 1 provided an initial test of the hypothesized link between mating motives and male aggression. After undergoing a mating prime, male participants performed a noise blast aggression task, a well-validated behavioral measure of aggression.

### Method

**Participants.** Fifty-one men completed the experiment for course credit.

**Procedure.** Participants first completed the priming procedure, which consisted of an essay writing task from previous research (Fitzsimons & Bargh, 2003; Maner et al., 2007). Participants assigned to the mating condition listed five things that made them feel sexual desire and wrote in detail about an experience involving intense sexual desire for approximately 10 min. Participants assigned to the control condition instead listed five things that made them feel happy and wrote about a time of intense happiness. The control condition was taken from previous research (Maner et al., 2007) and was designed to match the positive valence and emotional intensity of the sexual desire essay. The control condition helped rule out the possibility that any effects of priming condition would be due merely to changes in mood or arousal. Following the priming-procedure, participants completed the Brief Mood Introspection Scale (Mayer & Gaschke, 1988), providing measures of mood and arousal.

Next, participants were told they would complete an auditory reaction-time task with an ostensible partner and were shown a picture of a male confederate. The task consisted of the noise-blast task, a well-validated behavioral aggression measure used in many previous experiments (e.g., Bushman & Baumeister, 1998; Giancola & Zeichner, 1995). On each of 25 trials, participants reacted as quickly as possible to a tone played through headphones by clicking within a box on the computer screen. The loser of each trial was forced to listen to a painful blast of white noise set by their partner. Before each trial, participants chose both the volume and the duration of the noise blast that would be delivered to their partner if the participant won the trial. Selection options for both the volume and duration of the noise blast ranged from 0 (*no aggression*) to 10 (*maximum aggression*). As in previous research, participants were automatically assigned to lose half the trials. The volume and duration of the noise blast that participants heard after losing were identical across participants and increased incrementally throughout the task.

Participants set the volume and duration for the first trial before receiving any noise blasts from their partner. Participants (ostensibly) lost the first trial and received the noise blast set by their partner. Thus, on all but the first trial, participants were reacting in part to noise blasts (ostensibly) delivered by their partner, and they thought their behavior could elicit aggressive responses from their partner. This task therefore provides two distinct measures of aggression (unprovoked and provoked). Unprovoked aggression was computed by summing the standardized intensity and standardized duration of the noise blast set by the participant on the

first trial of the noise blast task, which occurred before participants received any noise blasts from the partner. Provoked aggression scores were computed by summing the standardized average intensity and standardized average duration of the noise blasts set by the participant for the remaining 24 trials. We had no *a priori* predictions about whether the predicted increases in aggression would apply to unprovoked versus provoked aggression. We therefore report results for both measures of aggression.<sup>2</sup>

## Results and Discussion

We predicted that the mating prime (vs. control prime) would increase men's aggression toward a same-sex partner. We tested for this effect on unprovoked and provoked aggression. Men who completed the mating prime ( $M = 0.43$ ,  $SD = 1.55$ ) showed more unprovoked aggression toward a partner than men who completed the control prime ( $M = -0.45$ ,  $SD = 1.48$ ),  $t(49) = 2.09$ ,  $p = .04$ . There was no effect of priming condition for provoked aggression ( $p = .42$ ). See Table 1 for unstandardized means and standard deviations of the aggression measures in the three current experiments.

We conducted ancillary analyses to test whether mood or arousal differed by priming condition to verify that effects were not caused merely by changes in mood or arousal. No differences were observed for mood ( $p = .49$ ) or arousal ( $p = .21$ ). Additionally, the effect of priming condition for unprovoked aggression with mood valence and arousal controlled was only very slightly reduced,  $F(1, 47) = 3.62$ ,  $p = .06$ ,  $\eta^2 = .07$ . Findings from Experiment 1 provided initial evidence that a mating prime increased aggression among men, although this effect was limited to a measure of unprovoked aggression.

Table 1  
*Means (and Standard Deviations) of Unstandardized Aggression*

Variable	Unprovoked	Provoked
Experiment 1		
Control	6.76 (3.26)	10.39 (3.71)
Mating	8.58 (3.17)	9.58 (3.21)
Experiment 2		
Control/No feedback	8.91 (4.14)	10.18 (3.04)
Mating/No feedback	11.89 (3.90)	11.34 (2.28)
Mating/Competitive feedback	9.52 (3.90)	10.49 (3.09)
Experiment 3		
Men with male target		
Control	7.00 (3.12)	9.78 (2.58)
Mating	9.37 (3.39)	11.25 (3.04)
Men with female target		
Control	7.32 (2.81)	9.36 (3.35)
Mating	6.57 (3.46)	9.59 (3.13)
Women with male target		
Control	7.74 (3.30)	9.05 (2.87)
Mating	8.57 (3.91)	9.37 (3.13)
Women with female target		
Control	7.71 (2.15)	8.68 (2.59)
Mating	8.00 (2.56)	9.29 (2.63)

*Note.* Aggression scores reflect the volume and duration of the noise blast and were indicated on a scale ranging from 0 (*no aggression*) to 20 (*maximum aggression*).

## Experiment 2

Experiment 2 was designed to isolate the hypothesized mechanism—a desire to dominate intrasexual competitors—underlying mating-induced male aggression. This was accomplished by having participants complete a competition with their partner prior to the behavioral aggression task. Some participants were randomly assigned to receive feedback that they had won the competition. We reasoned that because those participants had already achieved dominance over their partner, they would not be as motivated to respond to a mating prime with increased aggression. That is, we expected participants to respond to the mating prime (vs. control) with increased aggression, but only when they had been given no feedback about the competition. We expected that achieving dominance via winning the competition would weaken or eliminate the effect of the mating prime.

## Method

**Participants.** Eighty-one male undergraduates participated for course credit. Eleven participants were excluded (five participants knew their partner or the experimenter; four did not follow instructions during the aggression paradigm; and two expressed substantial suspicion during a postexperimental probe). Seventy participants remained.

**Procedure.** Participants arrived and were told that they would be completing several competitive tasks with an ostensible partner. After viewing a picture of a male confederate, participants completed three competitive tasks and were told their performance would be compared with the performance of their partner. In the first competitive task, participants were given 3 min to correctly identify as many word associations as possible from the Remote Associates Test (Mednick, 1968). To heighten the perceived importance of this task, the experimenter described the test as measuring verbal intelligence, quick thinking, and overall competence that tends to predict future success in private and professional domains. Next, participants performed a “creativity task” in which they were asked to list as many modes of transportation as possible in 90 s. The task was described as being predictive of future salary and career success. In the final competitive task, participants were asked to squeeze a handgrip as long as possible to measure physical strength. Participants were told that handgrip measurements provide one of the best measures of overall body strength.

Participants then completed the priming procedure from Experiment 1. Participants assigned to the mating condition listed five things that made them feel sexual desire and wrote about one specific event in greater detail. Participants assigned to the control condition completed the same task but instead listed and wrote about things that made them feel happy. Following the priming procedure, the experimenter delivered feedback to the participant about the competition. Participants who were primed with mating were randomly assigned to two competition feedback conditions. In the competitive-feedback condition, participants received their

<sup>2</sup> In addition to the procedure detailed here, participants also provided saliva samples before the priming procedure and after the noise blast task. These samples were intended to examine the role of testosterone in male aggression. Unfortunately, the salivary samples were unusable due to a malfunction of the gamma counter used to conduct the radioimmunoassays.



scores on each of the competitive tasks and the scores of their ostensible partner. The partner's scores were fabricated so that the participant performed better than the partner on each of the competitive tasks. In the no-competitive-feedback condition, participants received their own scores on each of the competitive tasks but were not told how well they scored in comparison to their partner. Instead, those participants were told that they would find out at the end of the experiment how well they scored in comparison to the partner. Participants in the control (nonmating) condition received feedback identical to those in the no-competitive-feedback condition; they received their own scores but no information about how well they had done relative to their partner. In sum, there were three experimental conditions: (a) mating prime with no competitive feedback, (b) mating prime with competitive feedback, and (c) control prime with no competitive feedback.

Participants then completed the Brief Mood Introspection Scale (Mayer & Gaschke, 1988), providing measures of mood and arousal. Finally, participants completed the noise-blast aggression paradigm, which provided measures of unprovoked and provoked aggression.

## Results

We expected men who completed the mating prime and who did not receive competitive feedback to demonstrate higher levels of aggression toward their partner, relative to men who completed the control prime. This would replicate the pattern from Experiment 1. However, we also predicted that this effect would be eliminated by the presence of competitive feedback; that is, we expected aggression among men in the mating prime/competitive feedback condition to be equivalent to that observed in the control condition.

To test these predictions, we first conducted two omnibus analyses of variance to determine whether unprovoked aggression or provoked aggression scores differed by experimental condition. The omnibus tests indicated significant differences in unprovoked aggression among the three experimental conditions,  $F(2, 67) = 3.32, p = .04, \eta^2 = .09$ . Provoked aggression scores did not differ significantly by condition ( $p = .60$ ). Three planned contrasts were used to deconstruct the significant omnibus test for unprovoked aggression. The first contrast tested for differences in unprovoked aggression among men in the mating and control condition who received no feedback about the competition. Consistent with Experiment 1, when participants received no feedback about the outcome of the competition, men who completed the mating prime ( $M = 0.75, SD = 1.49$ ) displayed more aggression than men who completed the control prime ( $M = -0.41, SD = 1.58$ ),  $F(1, 67) = 6.14, p = .02, \eta^2 = .08$ . The second planned contrast tested for differences in aggression between participants who completed the mating prime and were told they won the competition and participants who completed the control prime. We predicted that unprovoked aggression scores would not differ among these groups. Consistent with the prediction, participants in the mating condition who believed they won the competition ( $M = -0.17, SD = 1.52$ ) showed no increases in aggression compared with control participants ( $M = -0.41, SD = 1.58$ ),  $F(1, 67) = .33, p = .57, \eta^2 < .01$ . The final planned contrast tested for differences in unprovoked aggression among participants who completed the mating prime, and either did or did not receive feedback that they won the competition. Men primed with mating who won the competition

( $M = -0.17, SD = 1.52$ ) were significantly less aggressive than men primed with mating who received no feedback about the competition ( $M = 0.75, SD = 1.49$ ),  $F(1, 67) = 4.01, p < .05, \eta^2 = .06$ .

As in the previous experiment, we tested for differences across conditions in mood valence and arousal to rule out the possibility that these factors could account for the observed effects. Neither mood valence ( $p = .18$ ), nor arousal ( $p = .10$ ), differed by condition. Moreover, the effect of condition on unprovoked aggression remained significant even after controlling for mood valence and arousal,  $F(2, 65) = 3.52, p = .04, \eta^2 = .10$ .

Compared with men in the control condition, men who completed a mating prime and received no feedback about the outcome of the competition with their partner demonstrated higher levels of unprovoked aggression. This pattern is consistent with the finding from Experiment 1 and supports the hypothesis that mating motives increase aggressive behavior in men. However, this increase in aggression was observed only when men were not told about the outcome of the competition. Men who won the competition, and therefore who had affirmed their dominance over their partner, showed no increase in aggression. This supports the hypothesis that mating-induced male aggression is intended to increase a man's dominance over other men.

## Experiment 3

Experiment 3 was designed to replicate and extend the previous experiments in three main ways. First, the sample included participants of both sexes, allowing us to test for moderating effects of sex. We expected men, but not women, to respond to the mating prime with increased aggression. Second, we manipulated the sex of the participants' partner. In the previous experiments, participants were always led to believe that they had a same-sex partner. Our framework implies that mating-induced male aggression functions as a means of intrasexual competition. Therefore, although a mating prime was expected to increase men's aggression toward a male partner, we did not expect the prime to increase aggression toward a female partner. Third, we examined moderating effects of participants' sociosexual orientation (Simpson & Gangestad, 1991). We expected the effect of the mating prime on increased aggression to be especially pronounced among sexually unrestricted men—those who tend to pursue a short-term mating strategy. In sum, we hypothesized that (a) a mating prime would increase aggressive behavior among male participants, but not female participants, (b) this increase would be specific to men interacting with a male partner (not a female partner), and (c) the increased aggression would be more pronounced among sexually unrestricted men than restricted men. These hypotheses thus imply a four-way interaction among experimental prime, participant sex, partner sex, and sociosexual orientation. Evidence for this four-way interaction would provide strong evidence for the functional specificity of the hypothesized effect of mating motives on aggression.

## Method

**Participants.** One hundred eighty undergraduates participated for course credit. Three participants who correctly guessed that the partner was a confederate were excluded, leaving 177 participants (82 women).

**Procedure.** Participants completed the priming procedure detailed in the previous experiments. Participants who completed the mating prime wrote a detailed personal essay about an experience that led them to feel intense sexual desire, and participants who completed the control prime wrote a detailed personal essay about an experience that led them to feel intense happiness. Following the priming procedure, participants completed the Brief Mood Introspection Scale (Mayer & Gaschke, 1988) to measure mood and arousal. Then participants viewed a picture of either a male or female confederate who posed as their ostensible partner before completing the noise blast aggression paradigm.

Following the aggression paradigm, participants completed the Revised Sociosexual Orientation Inventory (RSOI; Penke & Asendorpf, 2008) to measure their sociosexual orientation. The RSOI assesses individual differences in willingness to engage in casual sexual relationships and includes items evaluating sexual behavior ("With how many different partners have you had sex within the past 12 months?"), attitudes ("Sex without love is OK"), and desire ("How often do you have spontaneous fantasies about having sex with someone you just met?"). High scores indicate a relatively unrestricted sociosexual orientation (i.e., orientation toward short-term

mating). RSOI scores ( $\alpha = .89$ ) did not vary by experimental condition ( $p = .16$ ), target sex ( $p = .67$ ), or their interaction ( $p = .30$ ).

## Results

To test for the hypothesized four-way interaction, priming condition, participant sex, target sex, and sociosexuality (standardized within gender), and all centered interactions were entered into a regression equation. (Regression was used because RSOI was a continuous variable.) The results for unprovoked aggression indicated a significant four-way interaction among priming condition, participant sex, target sex, and sociosexuality,  $\beta = 0.64$ ,  $p < .01$ , partial  $r = .21$ . See Figure 1. To interpret the pattern, we tested the three-way interaction of priming condition, participant sex, and sociosexuality within male and female targets. The interaction was significant for male targets,  $\beta = -0.37$ ,  $p < .01$ , partial  $r = -.26$ , but not female targets,  $\beta = 0.50$ ,  $p = .62$ , partial  $r = .04$ , indicating that there were no differences in aggression toward female targets. To further deconstruct the pattern within male targets, we tested the two-way interaction of priming condition and participant sex among sexually unrestricted participants (1 *SD*

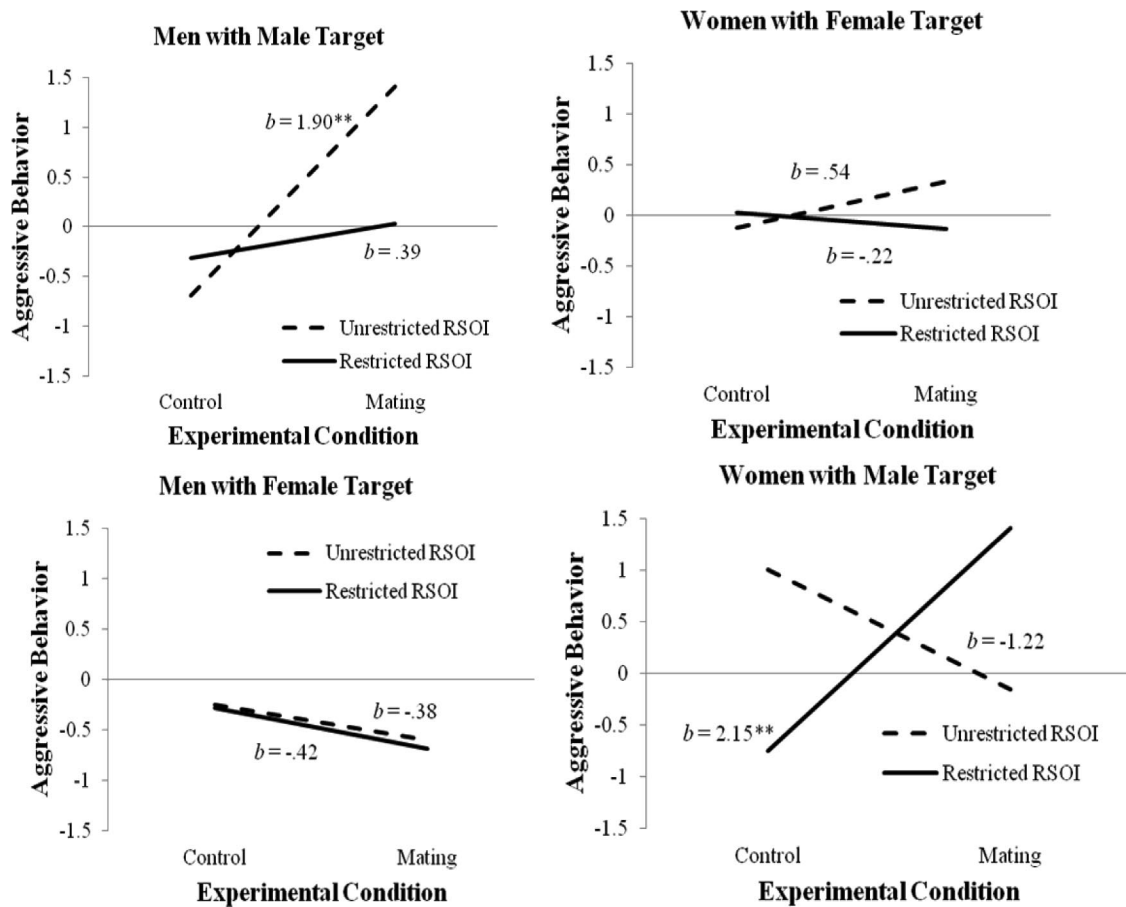


Figure 1. Experiment 3: The mating prime increased aggressive behavior toward a same-sex partner among unrestricted men, but not among restricted men or women. The mating prime failed to increase men's aggressive behavior toward an opposite-sex partner.  $b$  refers to unstandardized regression coefficients. RSOI = Revised Sociosexuality Orientation Inventory.  $^{**}p < .01$ .

above the mean) and restricted participants (1 *SD* below the mean). The interaction was significant among unrestricted participants,  $\beta = -1.47$ ,  $p < .01$ , partial  $r = -.24$ , and marginally significant (and in the opposite direction) among restricted participants,  $\beta = 0.83$ ,  $p = .07$ , partial  $r = .14$ .

To evaluate our specific hypotheses, we tested the simple effect of priming condition for male participants paired with a male partner. We tested this effect for men who were sexually unrestricted and relatively restricted. As predicted, there was a significant effect of priming condition among unrestricted men who were paired with a male partner,  $\beta = 0.58$ ,  $p < .01$ , partial  $r = .22$ . Unrestricted men assigned to the mating condition displayed significantly more unprovoked aggression than unrestricted men assigned to the control condition. There was no effect of priming condition among relatively restricted men,  $\beta = 0.12$ ,  $p = .55$ , partial  $r = .05$ .

We then tested the simple effect of priming condition for female participants who believed they were paired with a male partner. We observed an unpredicted priming effect such that restricted women primed with mating (relative to control) displayed more unprovoked aggression toward a male partner,  $\beta = 0.66$ ,  $p < .01$ , partial  $r = .23$ .

To provide evidence that mating-induced aggression among men serves functions associated with intrasexual competition, it is critical to rule out the possibility that the mating prime increased aggression even toward a female target. The nonsignificant three-way interaction among priming condition, participant sex, and sociosexuality provides some evidence of this, but to provide a more rigorous assessment of this possibility, we tested the simple effect of priming condition among unrestricted and restricted men who believed they were paired with a female partner. There was no effect of priming condition among unrestricted men,  $\beta = -0.12$ ,  $p = .57$ , partial  $r = -.05$ , or restricted men,  $\beta = -0.13$ ,  $p = .58$ , partial  $r = -.04$ . Therefore, regardless of their sociosexual orientation, men primed with mating did not show increases in aggression toward a female partner. In sum, the mating prime increased unprovoked aggression only among unrestricted men who believed they were paired with a male partner.

Evolutionary theories suggest that direct intrasexual aggression serves greater mating-related functions for males than for females. To further rule out the possibility that women primed with mating would show increases in aggression toward same-sex targets, we examined the simple effects of the mating prime among women interacting with a female partner. The mating prime did not affect unprovoked aggression toward a female partner among unrestricted women,  $\beta = 0.17$ ,  $p = .48$ , partial  $r = .06$ , or restricted women,  $\beta = -0.07$ ,  $p = .76$ , partial  $r = -.02$ .

Identical analyses were conducted on the measure of provoked aggression. The predicted four-way interaction approached significance,  $\beta = 0.41$ ,  $p = .08$ , partial  $r = .14$ . To test whether the pattern of effects was similar to that observed for unprovoked aggression, we again tested the three-way interaction among priming condition, participant sex, and sociosexuality for male and female targets. The three-way interaction was significant for male targets,  $\beta = -0.28$ ,  $p = .01$ , partial  $r = -.20$ , but not female targets,  $\beta = -0.01$ ,  $p = .91$ , partial  $r < -.01$ . For male targets, the two-way interaction of priming condition and participant sex was significant among unrestricted participants,  $\beta = -1.03$ ,  $p = .03$ , partial  $r = -.17$ , and marginally significant (and in the opposite

direction) among restricted participants,  $\beta = 0.75$ ,  $p = .10$ , partial  $r = .13$ . To test our specific hypotheses, we assessed the simple effect of priming condition among relatively unrestricted and restricted men paired with a male partner. Among unrestricted men, results indicated an effect of priming condition that approached significance,  $\beta = 0.32$ ,  $p = .10$ , partial  $r = .13$ . Men who completed the mating prime demonstrated (marginally) higher provoked aggression than men who completed the control prime. There was no effect of priming among restricted men,  $\beta = 0.03$ ,  $p = .89$ , partial  $r = .01$ . This pattern thus paralleled that for unprovoked aggression.

We also examined the simple effect of priming among women paired with a male partner. The only significant effect was observed among restricted women with a male partner,  $\beta = 0.51$ ,  $p = .02$ , partial  $r = .18$ , such that those primed with mating were more aggressive than those in the control condition.

The nonsignificant three-way interaction between priming condition, participant sex, and sociosexuality within female targets indicates that there were no differences in aggression toward a female target, but we nonetheless tested for the simple effects of priming condition for men and women paired with a female partner. There was no increase in aggression toward a female partner among unrestricted men,  $\beta = 0.13$ ,  $p = .52$ , partial  $r = .05$ , or restricted men,  $\beta = -0.16$ ,  $p = .50$ , partial  $r = -.05$ . Thus, findings for provoked aggression among men mirrored the pattern for unprovoked aggression, although the pattern was slightly weaker with respect to statistical significance. Additionally, no effects were observed among unrestricted women,  $\beta = 0.23$ ,  $p = .33$ , partial  $r = .08$ , or restricted women,  $\beta < .01$ ,  $p = .97$ , partial  $r < -.01$ , paired with a female partner.

To rule out the possibility that the results reported can be accounted for by mood valence or arousal, we tested whether mood and arousal differed by experimental condition. There were no differences in mood valence ( $p = .57$ ), or arousal ( $p = .64$ ). Additionally, we again tested the major analyses for unprovoked and provoked aggression, controlling for mood valence and arousal. The four-way interaction among mating condition, participant sex, target sex, and sociosexuality remained significant for unprovoked aggression,  $\beta = 0.21$ ,  $p < .01$ , partial  $r = .21$ , and marginally significant for provoked aggression,  $\beta = 0.13$ ,  $p = .10$ , partial  $r = .13$ .

Findings from this study were consistent with the hypotheses. As in the previous experiments, men primed with a mating motive showed increases in aggression. However, this effect was highly specific. First, it was observed only toward a male partner, not toward a female partner. Second, the effect was found only among sexually unrestricted men—those inclined to pursue a short-term mating strategy. Finally, the pattern of intrasexual aggression observed for men did not generalize to women. This is consistent with evolutionary theories emphasizing the relatively greater role of aggression in male (compared with female) intrasexual competition.

We did observe an unpredicted effect of the mating prime among women, such that restricted women became more aggressive toward a male partner. Restricted women tend to avoid intimate encounters with strangers (Simpson & Gangestad, 1991). Thus, one speculative interpretation is that having been primed with mating, restricted women may have viewed their male partner as a potential sexual threat; however, this finding should be interpreted with caution and requires replication.

## General Discussion

The current studies offer insight into the factors that motivate aggression in men and provide the first direct experimental evidence demonstrating that situationally activated mating motives cause men to engage in aggressive behavior. In each study, men primed with a mating motive assaulted a same-sex partner with louder and longer blasts of painful white noise. These studies thus provide rigorous experimental support for evolutionary theories suggesting that male violence serves underlying mating-related functions.

Mating primes failed to increase male violence when men first had achieved social dominance over their partner by winning a competition. This is consistent with the hypothesis that a desire to assert one's dominance over other men underlies men's aggression in response to mating-related situations. This research thus provides crucial information about when and why men behave violently.

## Implications of the Current Research

Several aspects of the current findings support the evolutionary view that male aggression is tied to intrasexual competition over access to potential mates. Moreover, the findings support the notion that male aggressive behavior serves functions associated with asserting one man's dominance over another. Indeed, men primed with mating displayed increased aggression toward a same-sex partner, but this effect was eliminated among men who achieved social dominance over their partner by winning a competition. Thus, mating primes increased physical aggression only when it was not possible to achieve social dominance through other (nonviolent) means. When men were given a less costly method of achieving social dominance, they showed no increase in aggression toward their partner. These findings provide the first rigorous experimental evidence directly linking mating motives, intrasexual competition, and aggressive behavior in men.

The specificity of the results provides additional evidence that male aggression is linked to intrasexual competition in the domain of mating. First, effects were specific to male participants; no increases in aggression toward same-sex partners were observed in female participants. This is consistent with evolutionary theories of sexual selection and differential parental investment, which emphasize the more substantial role direct aggression and intrasexual competition play in male (compared with female) mating strategies.

Second, mating-related increases in aggression among men were specific to male targets. Men who believed they were interacting with a female partner showed no increase in aggressive behavior. These findings can be contrasted with an experiment by Mussweiler and Förster (2000), in which priming the concept of sex increased men's aggression toward women, but not toward other men. Those authors suggested that priming the concept of sex activated a schema associated with sexuality, and in sexual situations men are more likely to be aggressing against women than other men. Our findings—rather than being produced by semantic activation or associationist priming—are more consistent with a view of male aggression as being caused by sexual motives and a desire for social dominance. The current studies provide important experimental support for evolutionary theories of mating, motivation, and male aggression.

Third, mating primes increased intrasexual aggression more strongly among men who were sexually unrestricted than those

who were sexually restricted. Because unrestricted men tend to seek relatively large numbers of mating opportunities, gaining access to new mates is a particularly relevant reproductive constraint. Therefore, direct intrasexual competition may be a more salient concern for unrestricted men than for restricted men. Indeed, the current findings are consistent with evidence that dominance displays and direct intrasexual competition are observed more strongly among unrestricted men than among restricted men (Simpson et al., 1999; Sundie et al., 2011). The current research is the first to demonstrate that sociosexuality moderates the link between mating motives and aggression. These findings highlight the important role of individual differences in evolutionary analyses. Contemporary evolutionary theories suggest that although all people possess mechanisms designed ultimately to increase reproductive success, those mechanisms interact with proximate individual differences to shape social behavior (Maner et al., 2009; Maner, Miller, Moss, Leo, & Plant, 2012; Schaller, Park, & Mueller, 2003). This research illustrates the value of integrating proximate (social psychological) and ultimate (evolutionary) approaches to understanding social behavior.

In the current studies, mating primes led men to increase their aggressive behavior even in the absence of an audience (cf. Griskevicius et al., 2009). While some mating-induced violence is likely to be motivated by self-presentational concerns, many instances of aggression are likely also to be driven more directly by a desire to dominate other men. This is consistent with the prevalence of male intrasexual aggression in many other species, for whom violent behavior often serves functions directly associated with social dominance (e.g., de Waal, 1982). We also saw evidence in the current studies that mating motives caused men to aggress against another man even in the absence of any provocation (i.e., aggression on the very first trial of the noise blast task). Although insults and other forms of provocation almost certainly increase the likelihood of aggression, the current findings suggest that provocation is not a requisite condition for mating-induced male violence. The current work thus extends previous evidence for the links among mating, dominance, and aggression in humans, and builds on the work of Griskevicius et al. (2009) and Daly and Wilson (e.g., 1983, 1988).

Implications of the current work extend beyond the laboratory. Evolutionary theorists have noted that many violent crimes committed by men are disproportionate to the situations that give rise to them (Wilson & Daly, 1985). In tying male violence to its more ultimate motivational roots, the current research provides a basis for understanding—and reducing—many seemingly irrational acts of violence. For example, the current findings suggest that providing people with peaceful routes to attaining social dominance might reduce their aggressive tendencies, as the competition did in Experiment 2. Indeed, to combat a social problem, one must identify not just its surface characteristics but also its underlying causes. In identifying those causes, an evolutionary approach provides a larger window into the factors underlying many dysfunctional forms of human social behavior.

## Limitations and Future Directions

Limitations of the current work provide valuable avenues for future investigation. For example, although we focused on direct physical aggression, which is especially common among men, we



did not measure indirect or verbal aggression, which tend to be more common among women (Archer & Coyne, 2005). There may be cases in which mating motives would lead women to indirectly aggress against other women (e.g., verbally derogating a romantic rival; Buss & Dedden, 1990), and future studies would benefit from more fully testing the conditions under which mating-related concerns affect agonistic behavior among women (see Griskevicius et al., 2009). Additionally, these studies relied on a laboratory measure of direct aggression among strangers. Our goal was to provide rigorous experimental tests of the link between mating motives and aggression, and the noise blast task provides an excellent behavioral measure of aggression. Nevertheless, ethical considerations place constraints on studying aggression in the lab, and future research would benefit from investigating other forms of aggressive behavior and doing so in other social contexts.

The current findings provided somewhat inconsistent evidence regarding effects of mating motives on unprovoked versus provoked aggression. Effects were found for unprovoked aggression in all three experiments, but provoked aggression only in Experiment 3. The evolutionary theory we tested in this research does not provide a strong basis for differentiating between provoked and unprovoked aggression, and thus we had no a priori hypotheses about which would be more strongly affected by the mating primes. Although there is evidence to suggest that provocation is likely to increase male violence, there is also evidence that both provoked and unprovoked aggression can play a role in male dominance competitions (Archer, 2004; Daly & Wilson, 1988; de Waal, 1982). We found stronger evidence for effects on unprovoked aggression than provoked aggression, and we suspect this is due to the fact that provocation, on its own, can elicit violent responses, and thus provocation may have obscured the effects of priming. Future research could profitably explore the extent to which the level and nature of provocation interacts with mating goals to affect violent behavior.

There are likely to be several theoretically interesting moderating variables left unexplored by these studies. One potentially important variable is men's level of testosterone. Testosterone is linked with the strength of men's short-term mating motives (e.g., McIntyre et al., 2006) and with their propensity to use aggression as a means of attaining social dominance (Archer, Birring, & Wu, 1998; Mazur & Booth, 1998; see also Ronay & von Hippel, 2010). Indeed, the moderating effect of sociosexual orientation in this research is consistent with the possibility that effects of mating motives on aggression would be particularly pronounced among males high in testosterone—a possibility that has been observed in a variety of other species (e.g., Archer, 2006). Evidence for the challenge hypothesis, for example, implies that increases in aggressive and competitive behavior during mating season are mediated by high levels of testosterone (Wingfield, Hegner, Dufty, & Ball, 1990). Men low in testosterone, who tend to be less physically imposing, may be more inclined to assert their dominance via less aggressive strategies (e.g., strategies that rely on humor or intelligence; e.g., Li et al., 2009). Future research would benefit from directly examining the role of testosterone—and other individual differences that covary with the strength of short-term mating motives—in determining the strategies people use to assert their dominance over others.

Future experiments would benefit from considering men's age to test whether relatively younger men (who sometimes lack

alternative routes to attaining status) respond to mating primes with more pronounced aggressive responses than older men (who often have attained status through other means). Indeed, Wilson & Daly's (1985) portrait of the *Young Male Syndrome* implies that competitiveness, risk taking, and aggression reflect sexually selected behaviors perpetrated especially by young men who lack alternative routes to gaining status. With this in mind, it may come as no surprise that the rate of violent crime and homicide is highest among men from ages 18 to 30 years old (Eisner, 2003).

An additional moderating variable to be examined in future research is a person's relationship status. Although partnered men (and women) might aggress against potential rivals who attempt to encroach upon their relationship (e.g., Maner et al., 2009), sexual motives might be less likely to increase aggression among individuals who are already pair-bonded; such individuals would have less to gain from behaving aggressively because they presumably are less inclined to compete with others over gaining access to new mates. Thus, although single versus partnered individuals might both behave aggressively, there are reasons to think that different motives underlie their aggressive behavior (i.e., relationship protection vs. mate-search).

Another moderating variable that might affect the extent to which mating goals increase aggression and violence involves the local sex ratio—that is, the ratio of men to women. When men outnumber women, competition among men for access to mates tends to increase (Griskevicius et al., 2012). Historical records indicate that locales with a male-biased sex ratio, such as 19th century China, have also experienced higher levels of violence and social unrest (Hudson & Den Boer, 2002). Directly examining these and other potential moderators provides valuable possibilities for future research.

## Conclusion

This research offers the most rigorous experimental evidence to date demonstrating that proximate mating motives increase aggressive behavior in men. In doing so, these studies also link male aggression to an underlying desire to achieve dominance. These findings add to a growing body of research linking proximate psychological and behavioral processes to their ancestral roots. Indeed, the current research integrated theories of motivation and social cognition within the metatheoretical framework of evolutionary psychology. In generating and testing hypotheses about male aggression, we considered not only proximate features of the person and the situation but also the underlying reproductive functions that aggression is designed to serve. Tying aggressive behavior to theories of sexual selection provides critical information about when, why, and in whom violence is likely to occur.

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