


Assailing the Competition: Sexual Selection, Proximate Mating Motives, and Aggressive Behavior in Men

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Abstract

Throughout history, men have tended to be more violent than women. Evolutionary theories suggest that this sex difference derives in part from their historically greater need to compete with other men over access to potential mates. In the current research, men and women (Experiment 1) or men only (Experiments 2 and 3) underwent a mating motive prime or control prime, and then performed a task designed to measure aggression toward a same-sex partner. The mating prime increased aggression among men, but not women (Experiment 1). Furthermore, mating-related increases in aggression were directed only toward men who were depicted as viable intrasexual rivals, including a dominant (vs. non-dominant) male partner (Experiment 2) and a man who was depicted as single (versus married) and looking for a mate (Experiment 3). This research provides a picture of male intrasexual aggression as highly selective and aimed strategically at asserting one's dominance over sexual rivals.

Keywords

aggression, mating, motivation, evolutionary psychology

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Across cultures and historical epochs, men have tended to be more violent than women (Archer, 2004; Wilson & Daly, 1988). Evolutionary theories suggest that this sex difference is linked to the different reproductive challenges faced by ancestral men and women throughout history (Buss & Schmitt, 1993; Daly & Wilson, 1983; Kenrick & Sheets, 1993). Such theories suggest that men's more violent nature stems at least partially from their relatively greater need to compete with one another over access to prospective mates.

Evolutionary theories provide a basis for generating predictions about the relationship between proximate mating motives and male aggression. Nonetheless, most evolutionarily inspired research has fallen short of examining the role proximate mating motives—motives that are acutely activated within a given situation—play in male aggression. Most evolutionary studies of male violence have instead relied on correlational methods or the presence of general sex differences in aggression to buttress theories about the role mating-related processes play in male violence. Two notable exceptions include Griskevicius et al. (2009) and Ainsworth and Maner (2012). Griskevicius et al. reported a study in which activation of a mating motive led men to express increased intentions to aggress against another man after imagining that the man had insulted them in front of a male audience. Ainsworth and Maner reported three studies

in which activation of a mating motive increased men's aggressive behavior even in the absence of provocation or an audience.

The current investigation is aimed at further elucidating the relationship between mating motives and male aggression, and it contributes to the literature in two important ways. First, we tested the hypothesis that mating-induced male aggression is highly selective and designed strategically to assert one's dominance over other men who represent active competitors in the mating market. Bio-social-cognitive models of aggression, such as the General Aggression Model, suggest that distal biological and genetic factors may influence aggression through the activation of aggressive cognition, aggressive affect, or arousal that leads to aggressive actions (e.g., Anderson & Carnagey, 2004; DeWall, Anderson, & Bushman, 2011). Indeed, much of the classic literature on sexual arousal and aggression was guided by a general model of aggression (Donnerstein, Donnerstein, & Evans, 1975; Malamuth, 1986).

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An evolutionary perspective usefully extends such models: because one function of male aggression is to compete over access to mating opportunities, mating primes should increase aggressive behavior only toward other men who reflect active and potent competitors in the mating market. We tested this hypothesis by manipulating aspects of the target of aggression. We manipulated both the dominance of the target (Experiment 2) and the relationship status of the target (Experiment 3), because those reflect characteristics that determine whether a man might be seen as an intrasexual rival.

A second contribution of the current research is to provide important conceptual replications of previous work on mating and male aggression by using new priming manipulations and dependent variables. With this goal in mind, the three current studies use two different priming manipulations (looking at attractive or less attractive faces in Experiments 1 and 2; looking at erotic pictures versus nature scenes in Experiment 3) and two different dependent variables (noise-blast task in Experiments 1 and 2; assigning an aversive task to a partner in Experiment 3). The primes used in the current work are especially useful, as previous studies have tended to use highly explicit primes aimed at eliciting high degrees of affect (e.g., Ainsworth & Maner, 2012), which leaves open the possibility that effects on aggression were partially due to high levels of affect or arousal.

Sexual Selection and Male Violence

Theories of sexual selection (Darwin, 1871) and differential parental investment (Trivers, 1972) provide insight into the evolutionary roots of male violence. These theories recognize that women have a greater minimum level of obligatory parental investment than men (due to gestation, childbirth, and lactation). Consequently, women are generally more inclined than men to pursue a high investment mating strategy and are more selective than men when choosing among potential mates (Buss & Schmitt, 1993). The selectivity of women limits men's access to prospective mates and thereby increases competition among men over access to mating opportunities (Geary, 1998). Women's level of obligatory parental investment also limits men's access to mates by skewing the operational sex ratio, which represents the proportion of fertile females to sexually active males (Clutton-Brock & Vincent, 1991).

The males of many sexually reproducing species compete with other males for mating opportunities using a variety of strategies including violence (Archer, 2009). Indeed, human males tend to be considerably greater than women in physical size and strength, characteristics thought to reflect a long evolutionary history of intrasexual male aggression (Andersson, 1994; Leigh, 1996). Violence is theorized to serve two functions in increasing mating opportunities. First, aggression is thought to have been designed through sexual selection to facilitate intrasexual competition. That is, men aggress against other men to compete over access to potential mates (i.e., increasing their own access and limiting that of rivals). Second,

aggression is thought to have been designed to serve functions associated with intersexual selection. Women are not necessarily attracted to aggressiveness, *per se*, but aggression may signal underlying traits such as social dominance that women do find attractive (Buss, 1988; Li, Bailey, Kenrick, & Linsenmeier, 2002; Sadalla, Kenrick, & Vershure, 1987; Schmitt & Buss, 1996). Thus, aggression has allowed men to increase their social dominance relative to other men and, at the same time, to increase their attractiveness to women.

A substantial body of work by Wilson and Daly suggests that, indeed, men display a stronger propensity for violence than women and violent behavior is particularly pronounced among men who lack alternative routes to obtaining social status (e.g., Wilson & Daly, 1985, 1988). This literature is limited, however, by the fact that it has focused primarily on men's general tendency to behave aggressively, as demonstrated by large sex differences in aggressive behavior. Despite the potential functionality of aggression, aggressive behavior diverts energy from the pursuit of other goals and can lead to injury or death. Thus, male aggression should be deployed in a highly selective manner. Because male aggression is ultimately aimed at increasing mating opportunities, men may display violence selectively in situations that activate mating-related motives. This would be consistent with evidence that, among many animal species, male aggression reaches its zenith during mating season (Archer, 2006), a time when mating motives are presumably most active.

There is only limited experimental evidence testing the hypothesis that proximate mating motives increase men's aggression toward other men. In a study by Griskevicius et al. (2009), men underwent a procedure designed to activate a mating motive, and then were asked to imagine that they were insulted by another man in front of an audience consisting of other men. Men in the mating condition reported that they would respond with more aggression than men in the control condition, but only in the presence of a male audience. Other recent work extended that evidence by demonstrating the effects of mating motives on actual aggressive behavior (Ainsworth & Maner, 2012). In three experiments, participants completed a mating prime and then a noise-blast aggression task with an ostensible same-sex partner. The experimental mating primes heightened male aggression, and the effect was pronounced among men with an unrestricted sociosexual orientation—those who are especially interested in seeking new mating opportunities and who are inclined to compete directly with others over mating opportunities (Simpson, Gangestad, Christensen, & Leck, 1999).

The Selective and Strategic Nature of Male Intrasexual Aggression

An evolutionary view hinges on the proposition that aggression can be used to achieve social dominance over intrasexual competitors. The use of physical aggression to achieve social dominance has been documented in cross-cultural and

historical data (Chagnon, 1988; Turke & Betzig, 1985), and attaining a relatively high standing in the dominance hierarchy has been linked to greater reproductive success for men (Betzig, 1986; Wilson & Daly, 1988).

If aggression serves mating-related functions, it should be deployed in a highly selective and strategic manner. It should be deployed selectively against other men who represent potent and active competitors in the mating market. The current studies therefore focused on two characteristics that determine whether another man might be seen as such a competitor. First, we manipulated the target's level of social dominance (Experiment 2). Social dominance is one factor known to increase the perception that another man is a potent intrasexual competitor (Buss, 1989; Buunk & Dijkstra, 2004; Gutierrez, Kenrick, & Partch, 1999). Indeed, women display heightened attention to men who display high levels of social dominance (Maner, DeWall, & Gailliot, 2008) and rate socially dominant men as especially desirable (Sadalla et al., 1987). In contrast, men who lack social dominance are relatively unattractive to women and therefore not likely to serve as potent intrasexual competitors (Buss & Schmitt, 1993).

Thus, although common sense might suggest that men would be more likely to aggress against non-dominant men than dominant men because the potential costs of retaliation presumably would be lower, we did not expect men to aggress against a non-dominant man because such a man is likely to be relatively unattractive to women and therefore not likely to serve as potent intrasexual competitor. Instead, intrasexual competition should be directed toward rivals who are most likely to succeed in winning women's affection. Thus, we predicted that men primed with a mating motive would show increases in aggression more strongly toward a socially dominant target than toward one who clearly lacks social dominance.

A second characteristic that should determine whether a man is viewed as an active competitor in the mating market is that man's relationship status. A man who is single and active in the mating market should be regarded as an immediate intrasexual rival. Thus, when mating motives are active, we would expect such a man to be targeted by increased levels of aggression. In contrast, a man who is clearly committed to a long-term romantic relationship and who is not interested in finding a new mate should not be regarded as much of a competitor. Consequently, even when mating motives are active, we would not expect a highly committed man to be targeted by aggression. We therefore manipulated the target's relationship status in Experiment 3. We predicted that a mating motive prime would increase aggression toward a single man, but not one who is committed to a long-term relationship.

The Current Research

In three experiments, we exposed participants to manipulations intended to prime a mating motive, and measured

aggression toward a same-sex target. After undergoing priming, participants in Experiments 1 and 2 performed a noise-blast task. Participants in Experiment 3 completed a photo selection task in which they had the opportunity to send disgusting/gory photographs to their partner. Consistent with evolutionary theories of mating and intrasexual competition, we predicted that a mating prime would increase aggressive behavior in men, but not women (Experiment 1). In addition to the manipulation of mating motives, male participants in Experiment 2 were led to believe that their partner possessed either high or low levels of social dominance. We predicted that men primed with mating would show increases in aggression more strongly toward a socially dominant target than toward one who clearly lacks social dominance. In Experiment 3, men were led to believe they would interact with a socially dominant man who was either single or married. We predicted that a mating motive would increase aggression more strongly toward a single man than a married man.

Experiment 1

Experiment 1 was designed to replicate and extend past work on proximate mating motives and aggression. Participants were randomly assigned to complete a mating prime (viewing highly attractive opposite-sex faces) or control prime (viewing less attractive faces). Attractive opposite-sex faces should activate mating motives to a greater extent than average-looking faces because both men and women tend to prefer highly attractive mates (Buss & Schmitt, 1993; Li et al., 2002). This manipulation has been used in previous research to activate mating motives (Baker & Maner, 2008; Wilson & Daly, 2004) and is appropriate for both male and female participants because both men and women place a high priority on physical attractiveness, especially in the context of short-term mating (Gangestad, Garver-Apgar, Simpson, & Cousins, 2007; Li & Kenrick, 2006; Maner, Gailliot, Rouby, & Miller, 2007; Maner et al., 2003). After undergoing priming, participants completed the noise-blast aggression task with an ostensibly same-sex partner.

Method

Participants. Eighty-two undergraduates participated for course credit. Twelve participants were excluded (3 experienced equipment malfunction, 1 hearing-impaired participant could not complete the experiment, 2 knew their partner, 2 guessed the hypotheses, 4 recently completed the aggression paradigm in another experiment and were aware of its purpose). Seventy participants remained (35 women, 35 men).¹

Procedure. Participants arrived for a study ostensibly involving learning and memory and viewed 10 attractive opposite-sex faces (mating condition) or 10 relatively less attractive

opposite-sex faces (control condition). Images appeared for 10 seconds in randomized order. An independent sample of undergraduates pre-rated the images on a 9-point scale for attractiveness, which was matched across sex ($M_{\text{attractive faces}} = 7.23$, $M_{\text{unattractive faces}} = 2.54$).

Participants then completed the Brief Mood Introspection Scale (Mayer & Gaschke, 1988), providing measures of mood and arousal. These measures were included to provide information about how the prime affected explicit arousal and affect. Due to the subtle nature of the prime, we did not expect to find any differences between conditions in mood or arousal. Next, participants were told they would complete an auditory reaction-time task with an ostensible partner and were shown a picture of a same-sex confederate. The confederates were White undergraduate students who appeared between 18 and 20 years old and were photographed while sitting in front of a computer in a psychology laboratory. The auditory reaction-time 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 participants heard after losing was 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 averaging 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 averaging the standardized average intensity and standardized average duration of the noise blasts set by the participant for the remaining 24 trials. We report results for both measures of aggression. The noise intensity and duration were highly correlated for both unprovoked aggression, $r = .40$, $p = .001$, and provoked aggression, $r = .87$, $p < .001$.

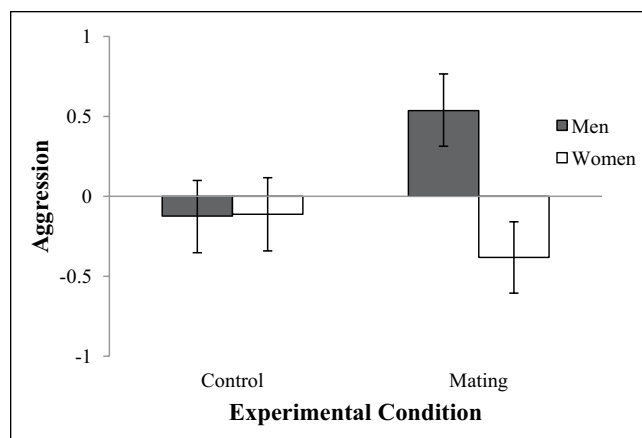


Figure 1. A mating prime increased aggressive behavior among men, but not women.

Note. Standardized aggression scores are reported.

Results

We predicted that men in the mating condition would display more aggression than men in the control condition. Women were not expected to show this effect. We first tested whether aggression scores differed for unprovoked and provoked aggression by conducting a within-subjects ANOVA with unprovoked and provoked aggression as the within-subjects factor and priming condition and participant sex as between-subjects factors. Results indicated a significant three-way interaction between priming condition, participant sex, and aggression measure (unprovoked versus provoked), $F(1, 66) = 9.11$, $p = .004$, $\eta^2 = .12$. This interaction was deconstructed by analyzing the results for unprovoked and provoked aggression separately.

In the first set of analyses, ANOVA was used to predict unprovoked aggression from priming condition, participant sex, and their interaction. The predicted interaction of priming condition and participant sex was not significant for unprovoked aggression, $F(1, 66) = 0.23$, $p = .64$, $\eta^2 < .01$. However, analyses for provoked aggression yielded the predicted interaction between priming condition and participant sex, $F(1, 66) = 4.24$, $p = .043$, $\eta^2 = .06$ (see Figure 1). Men who completed the mating prime behaved more aggressively toward their partner than men in the control condition, $F(1, 66) = 4.27$, $p = .043$, $\eta^2 = .06$, $d = 0.62$, 95% CI = $[-0.07, 1.28]$. No effect was observed in women, $F(1, 66) = 0.72$, $p = .40$, $\eta^2 = .01$, $d = -0.32$, 95% CI = $[-0.98, 0.35]$. See Table 1 for descriptive statistics.

Ancillary analyses confirmed that mood did not differ by priming condition, $p = .20$; participant sex, $p = .20$; or their interaction, $p = .73$. Arousal also did not differ by priming condition, $p = .72$; participant sex, $p = .85$; or their interaction, $p = .93$. In addition, we re-ran analyses controlling for mood and arousal. The interaction between priming condition and participant sex for provoked aggression changed

Table 1. Unstandardized Aggression Scores (Average Volume and Duration; 0 = No Aggression, 10 = Maximum Aggression).

| | Unprovoked | Provoked | |
|---------------------|------------------------|------------------------|---------------|
| | <i>M</i> (<i>SD</i>) | <i>M</i> (<i>SD</i>) | |
| Experiment 1 | | | |
| Men | | | |
| Control | 4.78 (2.46) | 4.68 (1.70) | <i>n</i> = 18 |
| Mating | 4.71 (2.11) | 5.83 (2.00) | <i>n</i> = 17 |
| Women | | | |
| Control | 3.56 (1.46) | 4.68 (1.64) | <i>n</i> = 17 |
| Mating | 3.92 (1.62) | 4.23 (1.13) | <i>n</i> = 18 |
| Experiment 2 | | | |
| Dominant partner | | | |
| Control | 3.41 (1.41) | 3.91 (1.34) | <i>n</i> = 11 |
| Mating | 4.50 (2.52) | 5.16 (1.41) | <i>n</i> = 17 |
| Neutral partner | | | |
| Control | 3.71 (2.58) | 4.33 (1.70) | <i>n</i> = 17 |
| Mating | 3.15 (1.14) | 3.98 (1.06) | <i>n</i> = 13 |

only very slightly, $F(1, 64) = 4.00, p = .050, \eta^2 = .06$, indicating that effects did not reflect changes in explicit mood or arousal. Indeed, participants did not display especially high scores on the measure of mood valence ($M = 8.01, SD = 5.28$; possible scores range from -24 to 24) or arousal ($M = 16.57; SD = 3.94$; possible scores range from 2 to 38), providing additional evidence that effects were not caused by high degrees of explicit arousal or affect.

Discussion

A mating prime increased aggressive behavior in men, but not women. These findings provide a conceptual replication of findings reported in both Ainsworth and Maner (2012) and Griskevicius et al. (2009) and demonstrate that the priming procedure exerted effects even without eliciting a high degree of explicit arousal or affect. The results of the current study are consistent with the evolutionary view that cues signaling the presence of a desirable mating opportunity should activate mating motives and increase male intrasexual violence.

Experiment 2

Experiment 2 was designed to replicate and extend Experiment 1 by including a manipulation of the ostensible partner's dominance. Theories of sexual selection imply that male intrasexual competition should be directed primarily at other men who reflect potent intrasexual competitors. Thus, we predicted that men primed with mating would demonstrate aggressive behavior toward another man depicted as high on social dominance but not toward another man depicted as clearly lacking social dominance. Because effects

were found only among men in Experiment 1, Experiment 2 included only male participants.

Method

Participants. Sixty-seven men completed the experiment for partial course credit for their Introduction to Psychology course. Nine participants were excluded (1 participant reported confusion about the experimental instructions, and 8 participants had recently completed the aggression paradigm in another experiment and were aware of its purpose). Data from 58 men were included in the analyses (see Note 1).

Procedure. Participants arrived individually to the lab for an experiment ostensibly on memory and learning. Participants began by writing a short introductory paragraph about themselves and then posing for a photograph that would be shared with the ostensible partner. Participants then completed the same priming procedure from Experiment 1. Men assigned to the mating prime viewed 10 photographs of attractive women, and men assigned to the control prime viewed 10 photographs of relatively less attractive women.

Following the priming procedure, all participants read the introductory paragraph that was (ostensibly) written by their partner and viewed a photograph of the partner. This served as the manipulation of the partner's social dominance. Participants randomly assigned to the dominant partner condition read a paragraph and viewed a picture that depicted the partner as high on social dominance:

Hey my name is Chris and I'm a Sophomore double majoring in Finance and Sports Management. I play intramural football for my fraternity Pi Kappa Alpha. I currently have an internship at the state Capitol. I also like to go out a lot to parties and bars, trying to meet new people and I date whenever I can.

Participants randomly assigned to the neutral partner condition read a paragraph that depicted the partner as low on social dominance.

Hey my name is Chris and I'm a Sophomore double majoring in Computer Science and Math. I am a member of Mu Alpha Theta, the math honors society on campus. I volunteer at the FSU radio station WVFS 89.7. I also like to stay in and play video games with my roommates whenever I can.

Pre-ratings from an independent sample of 43 participants (32 women, 11 men) in which each target was rated on a 7-point Likert-type scale confirmed that the dominant partner ($M = 5.63, SD = .90$) was viewed as significantly more dominant than the neutral partner ($M = 3.44, SD = 1.01$), $F(1, 42) = 99.76, p < .001, \eta^2 = .70$. The dominant partner ($M = 5.37, SD = 1.13$) was also perceived as more romantically desirable than the neutral target ($M = 3.56, SD = 1.20$),

$F(1, 42) = 42.29, p < .001, \eta^2 = .50$. No significant difference in ratings of likability was found, $F(1, 42) = 2.71, p = .11, \eta^2 = .06$.

Next, participants completed the noise-blast aggression task with their ostensible partner as described in Experiment 1. Participants completed 25 trials of the noise-blast task. As in Experiment 1, the volume and duration of the noise blasts set by the participants were standardized and averaged and provided two distinct measure of aggression. Results from the first trial of the noise-blast task provided a measure of unprovoked aggression, and the average of the next 24 trials provided a measure of provoked aggression. The noise intensity and duration were highly correlated for both unprovoked aggression, $r = .70, p < .001$, and provoked aggression, $r = .76, p < .001$.

To provide a check of the effectiveness of the social dominance manipulation, participants were asked to briefly write down their impressions of their partner. Participants were then asked to rate their partner on dominance and likeability on a 7-point Likert-type scale (1 = *not at all*, 7 = *very much*).

Results

The hypothesis of the current experiment was that men primed with a mating motive would display increased aggression primarily when they were competing with a socially dominant partner. We again tested whether scores for unprovoked and provoked aggression differed using a repeated measures ANOVA. Unprovoked and provoked aggression served as the within-subjects variable and priming condition and target condition were between-subjects variables. A non-significant three-way interaction indicated that effects on unprovoked and provoked scores for aggression did not differ, $F(1, 54) = 0.30, p = .58, \eta^2 < .01$. Based on the results of this analysis, we report ancillary analyses that combine aggression scores for all 25 trials, in addition to the scores for unprovoked and provoked aggression.

Given that effects in Study 1 were observed only for provoked aggression, we first report the results for that measure. Priming condition, target condition, and their interaction were entered into an ANOVA predicting provoked aggression scores. The priming condition by target condition interaction was significant, $F(1, 54) = 4.48, p = .039, \eta^2 = .08$ (see Figure 2). There was a significant effect of the mating prime among men in the dominant partner condition. Men who completed the mating prime (compared with the control prime) displayed more provoked aggression toward the dominant partner, $F(1, 54) = 5.13, p = .026, \eta^2 = .09, d = 0.90, 95\% \text{ CI} = [0.08, 1.67]$. As predicted, the prime did not have an effect among men in the non-dominant partner condition, $F(1, 54) = 0.56, p = .46, \eta^2 = .01, d = -0.24, 95\% \text{ CI} = [-0.96, 0.49]$. Similar analyses were conducted for unprovoked aggression. Consistent with Experiment 1, the interaction between priming condition and target condition was not

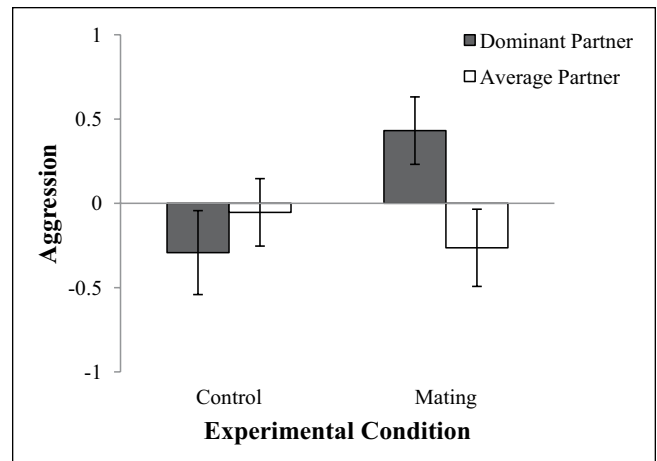


Figure 2. A mating prime increased aggressive behavior among men paired with a socially dominant partner, but not among men paired with a non-dominant partner.

Note. Standardized aggression scores are reported.

significant, $F(1, 54) = 2.09, p = .15, \eta^2 = .04$. See Table 1 for descriptive statistics.

The results for all 25 trials of the aggression measure were nearly identical to results based on the provoked aggression measure. We observed the predicted priming condition by target condition interaction, $F(1, 54) = 4.57, p = .037, \eta^2 = .08$. The mating prime led to increased aggression among men in the dominant partner condition, $F(1, 54) = 5.34, p = .025, \eta^2 = .09$, but not among men in the non-dominant partner condition, $F(1, 54) = 0.57, p = .46, \eta^2 = .01$.

Ancillary analyses confirmed that mood did not differ by priming condition, $p = .52$; target condition, $p = .47$; or their interaction, $p = .17$. Arousal also did not differ by priming condition, $p = .36$; target condition, $p = .94$; or their interaction, $p = .56$. In addition, we re-ran analyses controlling for mood and arousal. The interaction between priming condition and participant sex for provoked aggression was only slightly reduced, $F(1, 52) = 3.29, p = .076, \eta^2 = .059$. As in Experiment 1, participants displayed scores on the measure of mood valence ($M = 6.76, SD = 5.43$; possible scores range from -24 to 24) and arousal ($M = 16.90, SD = 4.61$; possible scores range from 2 to 38) that were slightly above the midpoint, providing additional evidence that the priming procedure exerted effects without eliciting especially high levels of explicit arousal or affect.

The manipulation check questions supported the effectiveness of the manipulation. Men in the dominant partner condition ($M = 4.54, SD = 1.04$) rated their partner as more dominant than men in the neutral partner condition ($M = 3.67, SD = 1.27$), $t(56) = -2.85, p = .006$. There were no differences in ratings of likeability, $t(56) = -0.98, p = .33$. These results suggest that the manipulation was effective in altering perceptions of social dominance without affecting perceptions of likeability.

Discussion

The current experiment adds to existing evidence that mating motives increase aggressive behavior toward other men, while also demonstrating the specificity of the effect. Men primed with mating demonstrated increased aggressive behavior toward a socially dominant partner but not toward a partner who clearly lacked social dominance. These findings provide evidence for the mating-related function of aggression. Although it may be less risky to aggress against men who lack social dominance, such behavior would be unlikely to increase access to mating opportunities. Evolutionary theories of intrasexual competition suggest that intrasexual competition should be directed primarily toward men who reflect potent intrasexual rivals, including socially dominant men, who are potentially appealing to women and are likely to compete effectively with other men over access to mates.

Experiment 3

Experiment 3 was designed to provide additional evidence for the mating-related function of male aggression. In this experiment, men were assigned to complete a mating or control prime and were led to believe they would be interacting with a target who was either single or married (based on the results of Experiment 2, we chose to depict both targets as relatively high in social dominance). We predicted that increases in aggression would be found only among men paired with a man who was depicted as a likely intrasexual competitor—a man who described himself as single and actively dating. We did not expect to find any increases in aggression toward the married target.

An additional feature of the current experiment was the use of a different mating prime and neutral control condition. Men in the mating condition were asked to view a series of erotic photographs, and men in the control condition were asked to view a series of nature landscape photographs. In the previous experiments, it is possible that the mating prime did not increase mating motives, but rather that the control condition (i.e., exposure to relatively unattractive faces) decreased mating motives. The use of a neutral, non-social control condition eliminates this potential ambiguity and is designed to provide stronger evidence for the mating-related function of aggression.

Method

Participants. Participants were a U.S. national sample recruited online through Amazon's Mechanical Turk (see Buhrmester, Kwang, & Gosling, 2011). One hundred nine male participants completed the experiment for \$0.25 compensation. Six participants expressed suspicion about the partner manipulation and were excluded from analyses, leaving a total of 103 male participants.²

Procedure. Participants were randomly assigned to a mating condition or neutral control condition. Participants in both conditions were asked to view a series of 15 photographs that were each displayed for 15 s in the context of an ostensible memory test. In the mating condition, participants were asked to view a series of erotic photographs.³ These photographs have been used in previous research (Price, Dieckman, & Harmon-Jones, 2011) and depicted a variety of highly attractive, semi-nude heterosexual couples in seductive poses. In the control condition, participants were asked to view nature photographs depicting a variety of natural settings including the ocean, mountains, and a forest.

After viewing the photographs, participants were told they would be paired with another MTurk worker for the remainder of the experiment. Participants were informed that each person would complete some basic demographic information, some of which would be shared with the partner so that they could get to know each other better. Participants were then prompted to answer a variety of demographic questions including their sex, age, occupation, location, and relationship status. To increase the believability of the manipulation, participants experienced a brief waiting period to allow the other participant time to finish typing their answers. Participants were then informed that the other MTurk worker had completed the questions and several of that person's answers had been randomly selected to be shared. At this point in the experiment, the target relationship status manipulation was delivered. All participants saw that the other person was male and worked as a litigation attorney (a profession associated with high social dominance). Participants in the married partner condition saw that the other person was married, whereas participants in the single partner condition saw that the other person had selected the answer choice "single (or divorced) but actively dating."

Participants were instructed that the next portion of the study involved pre-rating photographs to be used in future research. This task constituted the measure of aggressive behavior (modified from Mussweiler & Förster, 2000). The instructions indicated that each participant would pre-rate a set of 20 photographs within one of three categories: nature photographs, disgusting/gory photographs, and photographs of faces. Each participant would select the photographs to be rated by the other person because the researchers did not want participants selecting their own stimuli. Participants then viewed an example photograph from each stimulus category. The example photograph was a mountainous landscape scene for the nature category, a bloodied knee for the disgusting/gory category, and a head shot of an average-looking man for the faces category. Participants were asked to rate the extent to which they wanted the other person to rate each photograph category on a 9-point Likert-type scale (1 = *not at all*, 9 = *very much*). The extent to which participants wanted the other person to view the disgusting/gory photograph category served as the measure of aggressive behavior in this experiment. Although this measure is less

Table 2. Extent to Which Participants Expressed Desire to Send Each Stimulus Set to Their Partner (1 = Not at All, 9 = Very Much).

| | Gory/disgusting stimuli | Facial stimuli | Nature stimuli | |
|---------------------|-------------------------|------------------------|------------------------|---------------|
| | <i>M</i> (<i>SD</i>) | <i>M</i> (<i>SD</i>) | <i>M</i> (<i>SD</i>) | |
| Experiment 3 | | | | |
| Single partner | | | | |
| Control | 2.58 (2.00) | 4.35 (2.58) | 6.35 (2.31) | <i>N</i> = 26 |
| Mating | 4.33 (3.13) | 4.56 (2.17) | 5.00 (2.92) | <i>N</i> = 27 |
| Married partner | | | | |
| Control | 3.64 (2.77) | 4.23 (2.05) | 5.64 (2.80) | <i>N</i> = 22 |
| Mating | 3.25 (2.74) | 4.61 (2.17) | 5.64 (2.21) | <i>N</i> = 28 |

Note. The gory/disgusting stimulus set served as the measure of aggression.

violent than the noise-blast task (in the physical sense), it still reflects aggression, defined as any behavior intended to harm or bring about a negative state in another person (Anderson & Bushman, 2002).

Results

Across conditions, participants expressed the most interest in sending the nature photographs to their partner ($M = 5.65$, $SD = 2.58$), followed by the facial photographs ($M = 4.45$, $SD = 2.23$), and then the gory/disgusting photographs ($M = 3.45$, $SD = 2.73$). See Table 2 for descriptive statistics. The hypothesis in this experiment was that a mating prime (vs. control prime) would increase participants' desire to send a disgusting/gory stimulus set toward a single man, but not a married man.

Priming condition, target relationship status condition, and their interaction were entered in ANOVA as predictors of the desire to send the gory/disgusting stimulus set. Consistent with predictions, results indicated a significant priming condition by target relationship status condition interaction, $F(1, 99) = 4.04$, $p = .047$, $\eta^2 = .04$ (see Figure 3). Within the single partner condition, men primed with mating expressed greater desire to send gory/disgusting photographs to their partner compared with men in the control condition, $F(1, 99) = 5.63$, $p = .020$, $\eta^2 = .05$, $d = 0.66$, 95% CI = [0.10, 1.21]. Within the married partner condition, men primed with mating were no more likely than men in the control condition to want to send the other participant disgusting/gory photographs, $F(1, 99) = 0.25$, $p = .62$, $\eta^2 < .01$, $d = -0.14$, 95% CI = [-0.70, 0.42].

This effect of the mating prime did not extend to participants' desire to send the nature stimulus set or the facial stimulus set. For the nature stimulus set, no effect of priming condition, $p = .19$; target relationship status condition, $p = .95$; or their interaction was observed, $p = .19$. The facial stimulus set yielded similar results. No effect of priming condition, $p = .51$; target relationship status condition, $p = .94$; or their interaction, $p = .85$, was observed.

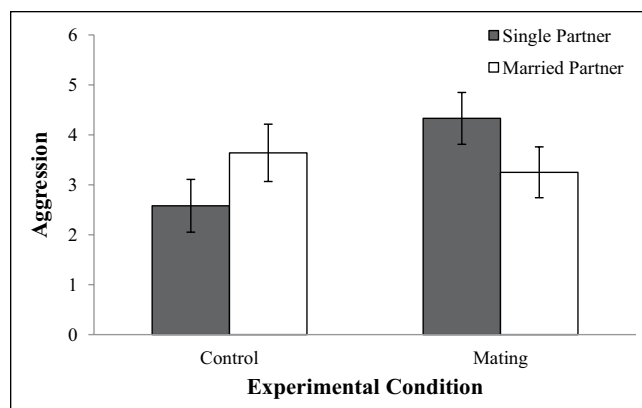


Figure 3. A mating prime increased aggressive behavior among men paired with a partner who was single, but not among men paired with a partner who was married.

Discussion

Experiment 3 further elucidated the relationship between mating motives and male aggression. A mating prime led to increased aggressive behavior among men who believed they were interacting with a single partner, but not among men led to believe they were interacting with a married partner. Experiment 3 provides further evidence that the effect of mating motives on male aggression is moderated by the extent to which the putative object of aggression is perceived as a potent and active intrasexual competitor (in this case, one who is single and interested in dating). Taken together, the findings indicate that mating motives increase aggression primarily toward other men who are perceived as immediate intrasexual rivals whether due to their social dominance (Experiment 2) or their relationship status (Experiment 3).

General Discussion

The current studies provide experimental evidence that proximate mating motives cause aggressive behavior among men. Moreover, they provide evidence suggesting that mating-induced aggression is aimed strategically at asserting one's dominance over intrasexual rivals who are perceived to be active competitors in the mating arena. In Experiment 2, men primed with mating motives displayed increased aggression toward a man high in social dominance, but not one low in social dominance. Experiment 3 found that mating motives increased aggression only toward a man depicted as single and actively looking for a partner, but not toward a man who was married and therefore committed to a long-term partner. These results are compatible with existing social psychological theories of aggression, which emphasize that biological and genetic factors may influence aggression through proximal cognitive and affective factors (Anderson & Carnagey, 2004; DeWall et al., 2011). Future research could use this

model to investigate proximate changes in cognition or motivation that might mediate the effects we observed here. Nonetheless, by incorporating an evolutionary perspective, the current research extends such models by generating and testing specific predictions that are unlikely to have been generated from proximate-level social psychological models alone.

The desire to find a mate does not lead men to aggress indiscriminately against other men. Instead, our findings suggest that men's aggression is directed specifically at other men who could serve as potent and realistic intrasexual competitors. This research thus provides a nuanced portrait of male aggression as highly selective and strategic. Such a portrait is consistent with the operation of evolved, adaptive mechanisms.

Additionally, the effects found in Experiments 1 and 2 were obtained using a less overt mating prime than has been used in previous research. The experiments reported in Ainsworth and Maner (2012) relied on a highly explicit and conscious priming manipulation in which participants wrote an essay about a time in which they felt intense sexual desire. The manipulations involved a high degree of explicit arousal and conscious sexual thinking. In contrast, in Experiments 1 and 2, merely exposing men to images of attractive (vs. less attractive) females increased their aggressive behavior toward another man. The ecological validity of the manipulation is supported by the observation that cues of female fertility are especially attractive to the males of many species and exposure to those cues elicits male aggression (Wingfield, Hegner, Dufty, & Ball, 1990). In humans, physical attractiveness reflects phenotypic cues signaling reproductively relevant traits that are prioritized in everyday mating preferences and choices (e.g., Buss, 1989).

The foundational work of Wilson and Daly provided a portrait of the ultimate evolutionary factors giving rise to large-scale sex differences in aggression and highlighted the important role of intrasexual competition in producing violent behavior. The current work extends this literature by demonstrating that proximate, situationally activated mating motives increase intrasexual aggressive behavior in men. The current work also illustrates the value of testing theories from evolutionary biology with rigorous priming methods from experimental psychology.

Additionally, the current research provides additional evidence for sex differences in aggressive responses to a situational mating prime. Although mating-related increases in aggression were observed in men, no increases were seen in women (Experiment 1). Findings are consistent with theories of sexual selection and differential parental investment that emphasize the relatively greater role intrasexual competition plays in male versus female mating. Thus, this study provides important experimental support for evolutionary theories pertaining to sex differences in violent behavior, and provides evidence for the differential role of proximate mating motives in male versus female aggression.

It should be noted that no sex differences in aggression were observed in the control condition. This pattern is consistent with a view in which men's higher propensity for aggression reflects responses to situations specifically evoking concerns about sex or competition, rather than a global orientation toward aggressive behavior. This research thus provides a textured view of male aggression, and the social functions it serves.

We observed some evidence suggesting stronger effects for provoked aggression (i.e., aggression in response to noise blasts from the partner) than unprovoked aggression in Experiments 1 and 2 (although the interaction with aggression measure was not significant in Experiment 2, so any conclusions should be considered with caution). This finding can be contrasted with those reported in Ainsworth and Maner (2012), which found effects for both unprovoked and provoked aggression. One possible explanation for the divergent findings involves the different mating primes used in the two investigations. Whereas Ainsworth and Maner used a strong and highly explicit sexual arousal prime, the current experiments used a relatively subtler manipulation of mating motives. Consequently, in the current studies some level of provocation may have been needed to elicit aggressive responses. This possibility is consistent with the challenge hypothesis (e.g., Wingfield et al., 1990). During breeding season, males of other species experience an increase in testosterone and aggression when challenged or provoked by other males (Wingfield et al., 1990). Nevertheless, evolutionary theories of intrasexual competition and male aggression do not provide an unequivocal basis for differentiating between provoked and unprovoked aggression. Future research could profitably explore this distinction more carefully.

Limitations of the current work provide valuable avenues for future investigation. The current research focused on how characteristics of the partner (i.e., social dominance and relationship status) affect men's propensity to engage in aggressive behavior. One open question is how men's own traits might interact with the traits of intrasexual competitors to predict aggressive behavior. Based on previous research, one might expect that the effects of Experiment 2 may have been even stronger among men with a lower social status because those men have more to gain from aggression (Kenrick & Sheets, 1993; Wilson & Daly, 1985). Nonetheless, there are also potential costs to aggressing against another man who is substantially stronger or more dominant than oneself. Intrasexual competition therefore may be most likely to occur when individuals are nearly equally matched, and less competition may occur as the differences between individuals becomes larger (Wilson & Daly, 1985). A man's own relationship status may also affect the propensity to respond violently to intrasexual competitors, such that men in committed relationships would be less likely to aggress presumably because they are not interested in finding new mates. These potential boundary conditions to the current work could be profitably investigated in future research.

The current work is also limited because we focused on physical aggression and did not measure indirect aggression, which is more common in women (Archer & Coyne, 2005). Future research would profit from assessing the conditions under which mating-related concerns might affect agonistic behavior among women (see Griskevicius et al., 2009).

Additionally, although the dependent measures in this research provide rigorous and tightly controlled laboratory measures of aggression, they lack certain aspects of real-world violence; for example, receiving a loud blast of white noise is painful but does not produce any actual injury. The extent to which the current findings would generalize to more injurious forms of violent behavior remains unclear. Future research would benefit from measuring other forms of aggressive behavior, including those involving higher apparent physical consequences. Nonetheless, there is reason to expect that our results may generalize to more injurious forms of aggressive behavior. Research comparing aggressive behavior in the laboratory and in field studies on average shows a high level of correspondence in effect sizes (Anderson & Bushman, 1997; Anderson, Lindsay, & Bushman, 1999).

Potential implications of this research extend beyond the laboratory. Evolutionary theories have noted that violent acts committed by men are often more severe than the situations that seemingly give rise to them (Wilson & Daly, 1985). By linking male violence to its adaptive roots, the current research may provide a basis for developing interventions aimed at reducing seemingly irrational acts of violence. 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.

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Notes

1. All data exclusions, conditions, and dependent measures have been reported. The sample size was set a priori to be a minimum of 20 participants per group, but in practice we collected as much data as possible during the semester.
2. All data exclusions, conditions, and dependent measures have been reported. The sample size was set a priori to be 30

- participants per group, but in practice we collected as much data as possible during the week the experiment was posted online.
3. The photographs were taken from a database of images provided by Eddie Harmon-Jones. We are grateful for his assistance.

Supplemental Material

The online supplemental material is available at <http://pspb.sagepub.com/supplemental>.

References

- Ainsworth, S. E., & Maner, J. K. (2012). Sex begets violence: Mating motives, social dominance, and physical aggression in men. *Journal of Personality and Social Psychology, 103*, 819-829. doi:10.1037/a0029428
- Anderson, C. A., & Bushman, B. J. (1997). External validity of "trivial" experiments: The case of laboratory aggression. *Review of General Psychology, 1*, 19-41. doi:10.1037/1089-2680.1.1.19
- Anderson, C. A., & Bushman, B. J. (2002). Human aggression. *Annual Review of Psychology, 53*, 27-21. doi:10.1146/annurev.psych.53.100901.135231
- Anderson, C. A., & Carnagey, N. L. (2004). Violent evil and the general aggression model. In A. Miller (Ed.), *The social psychology of good and evil* (pp. 168-192). New York, NY: Guilford Press.
- Anderson, C. A., Lindsay, J. J., & Bushman, B. J. (1999). Research in the psychology laboratory: Truth or triviality? *Current Directions in Psychological Science, 8*, 3-9. doi:10.1111/1467-8721.00002
- Andersson, M. (1994). *Sexual selection*. Princeton, NJ: Princeton University Press.
- Archer, J. (2004). Sex differences in aggression in real-world settings: A meta-analytic review. *Review of General Psychology, 8*, 291-322. doi:10.1037/1089-2680.8.4.291
- Archer, J. (2006). Testosterone and human aggression: An evaluation of the challenge hypothesis. *Neuroscience & Biobehavioral Reviews, 30*, 319-345. doi:10.1016/j.neubiorev.2004.12.2007
- Archer, J. (2009). Does sexual selection explain human sex difference in aggression? *Behavioral & Brain Sciences, 32*, 249-311. doi:10.1017/S0140525X09990951
- Archer, J., & Coyne, S. M. (2005). An integrated review of indirect, relational, and social aggression. *Personality Social Psychology Review, 9*, 212-230. doi:10.1207/s15327957pspr0903_2
- Baker, M. D., & Maner, J. K. (2008). Risk-taking as a situationally sensitive male mating strategy. *Evolution & Human Behavior, 29*, 391-395. doi:10.1016/j.evolhumbehav.2008.06.001
- Betzig, L. L. (1986). *Despotism and differential reproduction: A Darwinian view of history*. Hawthorne, NY: Aldine Transaction.
- Buhrmester, M., Kwang, T., & Gosling, S. D. (2011). Amazon's Mechanical Turk: A new source of inexpensive, yet high-quality, data? *Perspectives on Psychological Science, 6*, 3-5. doi:10.1177/1745691610393980
- Bushman, B. J., & Baumeister, R. F. (1998). Threatened egotism, narcissism, and self-esteem, and direct and displaced aggression: Does self-love or self-hate lead to violence? *Journal of Personality and Social Psychology, 75*, 219-229. doi:10.1037/0022-3514.75.1.219
- Buss, D. M. (1988). The evolution of human intrasexual competition: Tactics of mate attraction. *Journal of Personality and Social Psychology, 54*, 616-628. doi:10.1037/0022-3514.54.4.616

- Buss, D. M. (1989). Sex-difference in human mate preferences: Evolutionary hypothesis tested in 37 cultures. *Behavioral & Brain Sciences*, *12*, 1-14.
- Buss, D. M., & Schmitt, D. P. (1993). Sexual strategies theory: An evolutionary perspective on human mating. *Psychological Review*, *100*, 204-232. doi:10.1037/0033-295X.100.2.204
- Buunk, B. P., & Dijkstra, P. (2004). Gender differences in rival characteristics that evoke jealousy in response to emotional versus sexual infidelity. *Personal Relationships*, *11*, 395-408. doi:10.1111/j.1475-6811.2004.00089.x
- Chagnon, N. A. (1988). Life histories, blood revenge, and warfare in a tribal population. *Science*, *483*, 985-992. doi:10.1126/science.239.4843.985
- Clutton-Brock, T. H., & Vincent, A. C. J. (1991). Sexual selection and the potential reproductive rates of males and females. *Nature*, *351*, 58-60. doi:10.1038/351058a0
- Daly, M., & Wilson, M. (1983). *Sex, evolution, and behavior: Adaptations for reproduction* (2nd ed.). Boston, MA: Willard Grant Press.
- Darwin, C. (1871). *The descent of man and selection in relation to sex*. London, England: Murray.
- DeWall, C. N., Anderson, C. A., & Bushman, B. J. (2011). The General Aggression Model: Theoretical extensions to violence. *Psychology of Violence*, *1*, 245-258. doi:10.1037/a0023842
- Donnerstein, E., Donnerstein, M., & Evans, R. (1975). Erotic stimuli and aggression: Facilitation or inhibition. *Journal of Personality and Social Psychology*, *32*, 237-244. doi:10.1037/0022-3514.32.2.237
- Gangestad, S. W., Garver-Apgar, C. E., Simpson, J. A., & Cousins, A. J. (2007). Changes in women's mate preferences across the ovulatory cycle. *Journal of Personality and Social Psychology*, *92*, 151-163. doi:10.1037/0022-3514.92.1.151
- Geary, D. C. (1998). *Male, female: The evolution of human sex differences*. Washington, DC: American Psychological Association.
- Giancola, P. R., & Zeichner, A. (1995). Construct validity of a competitive reaction-time aggression paradigm. *Aggressive Behavior*, *21*, 199-204. doi:10.1002/1098-2337(1995)21:3<199::AID-AB2480210303>3.0.CO;2-
- Griskevicius, V., Tybur, J. M., Gangestad, S. W., Perea, E. F., Shapiro, J. R., & Kenrick, D. T. (2009). Aggress to impress: Hostility as an evolved context-dependent strategy. *Journal of Personality and Social Psychology*, *96*, 980-994. doi:10.1037/a0013907
- Gutierrez, S. E., Kenrick, D. T., & Partch, J. J. (1999). Beauty, dominance, and the mating game: Contrast effects in self-assessment reflect gender differences in mate selection. *Personality and Social Psychology Bulletin*, *25*, 1126-1134. doi:10.1177/01461672992512006
- Kenrick, D. T., & Sheets, V. (1993). Homicidal fantasies. *Ethology and Sociobiology*, *14*, 231-246. doi:10.1016/0162-3095(93)90019-E
- Leigh, S. R. (1996). Evolution of human growth spurts. *American Journal of Physical Anthropology*, *4*, 455-474. doi:10.1002/(SICI)1096-8644(199612)101:4<455::AID-AJPA2>3.0.CO;2-V
- Li, N. P., Bailey, J. M., Kenrick, D. T., & Linsenmeier, J. A. (2002). The necessities and luxuries of mate preferences: Testing the trade-offs. *Journal of Personality and Social Psychology*, *82*, 947-955. doi:10.1037/0022-3514.82.6.947
- Li, N. P., & Kenrick, D. T. (2006). Sex similarities and differences in preferences for short-term mates: What, whether, and why. *Journal of Personality and Social Psychology*, *90*, 468-489. doi:10.1037/0022-3514.90.3.468
- Malamuth, N. M. (1986). Predictors of naturalistic sexual aggression. *Journal of Personality and Social Psychology*, *50*, 953-962. doi:10.1037/0022-2514.50.5.953
- Maner, J. K., DeWall, C. N., & Gailliot, M. T. (2008). Selective attention to signs of success: Social dominance and early stage interpersonal perception. *Personality and Social Psychology Bulletin*, *34*, 488-501. doi:10.1177/0146167207311910
- Maner, J. K., Gailliot, M. T., Rouby, D. A., & Miller, S. L. (2007). Can't take my eyes off of you: Attentional adhesion to mates and rivals. *Journal of Personality and Social Psychology*, *93*, 389-401. doi:10.1037/0022-3514.93.3.389
- Maner, J. K., Kenrick, D. T., Becker, D. V., Delton, A. W., Hofer, B., Wilbur, C. J., & Neuberg, S. L. (2003). Sexually selective cognition: Beauty captures the mind of the beholder. *Journal of Personality and Social Psychology*, *85*, 1107-1120. doi:10.1037/0022-3514.85.6.1107
- Mayer, J. D., & Gaschke, Y. N. (1988). The experience and meta-experience of mood. *Journal of Personality and Social Psychology*, *55*, 102-111. doi:10.1037/0022-3514.55.1.102
- Mussweiler, T., & Förster, J. (2000). The sex-aggression link: A perception-behavior dissociation. *Journal of Personality and Social Psychology*, *79*, 507-520. doi:10.1037/0022-3514.79.4.507
- Price, T. F., Dieckman, L., & Harmon-Jones, E. (2011, October). *The effect of body posture on startle eyeblink responses to erotic pictures*. Paper presented at the 51st annual meeting of the Society of Psychophysiological Research, Florence, Italy.
- Sadalla, E. K., Kenrick, D. T., & Vershure, B. (1987). Dominance and heterosexual attraction. *Journal of Personality and Social Psychology*, *52*, 730-738. doi:10.1037/0022-3514.52.4.730
- Schmitt, D. P., & Buss, D. M. (1996). Strategic self-promotion and competition derogation: Sex and conflict effects on perceived effectiveness of mate attraction tactics. *Journal of Personality and Social Psychology*, *70*, 1185-1204. doi:10.1037/0022-3514.70.6.1185
- Simpson, J. A., Gangestad, S. W., Christensen, P. N., & Leck, K. (1999). Fluctuating asymmetry, sociosexuality, and intrasexual competitive tactics. *Journal of Personality and Social Psychology*, *76*, 159-172. doi:10.1037/0022-3514.76.1.159
- Trivers, R. L. (1972). Parental investment and sexual selection. In B. Campbell (Ed.), *Sexual selection and the descent of man: 1971-1971* (pp. 136-179). Chicago, IL: Aldine Transaction.
- Turke, P., & Betzig, L. (1985). Those who can do: Wealth, status, and reproductive success on Ifaluk. *Ethology and Sociobiology*, *6*, 79-87. doi:10.1016/0162-3095(85)90001-9
- Wilson, M., & Daly, M. (1985). Competitiveness, risk-taking, and violence: The young male syndrome. *Ethology and Sociobiology*, *6*, 59-73. doi:10.1016/0162-3095(85)90041-X
- Wilson, M., & Daly, M. (1988). *Homicide*. New York, NY: Aldine de Gruyter.
- Wilson, M., & Daly, M. (2004). Do pretty women inspire men to discount the future? *Proceedings of the Royal Society B. Biological Sciences (Biological Letters)*, *271*, S177-S179. doi:10.1098/rsbl.2003.0134
- Wingfield, J. C., Hegner, R. E., Dufty, A. M., & Ball, G. F. (1990). The challenge hypothesis: "theoretical implications" for patterns of testosterone secretion, mating systems, and breeding strategies. *The American Naturalist*, *136*, 829-846. doi:10.1086/285134