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Tobias Greitemeyer [a], Andreas Kastenmüller [b] & Peter Fischer [c]
[a] Department of Psychology, University of Innsbruck, Innsbruck, Austria
[b] John Moores University, Liverpool, UK
[c] University of Regensburg, Regensburg, Germany
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Romantic motives and risk-taking: an evolutionary approach

Tobias Greitemeyer[a]*, Andreas Kastenmüller[b] and Peter Fischer[c]

[a]*Department of Psychology, University of Innsbruck, Innsbruck, Austria;* [b]*John Moores University, Liverpool, UK;* [c]*University of Regensburg, Regensburg, Germany*

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Risk-taking behavior is puzzling insofar as it may involve considerable losses (such as increased mortality rates). The present research advances an evolutionary account of risk-taking behavior in that one of its main functions is to get access to potential mating partners. Inasmuch as reproductive competition among men is more pronounced than among women, men in particular are expected to take risks in order to gain sexual access to women. In fact, four studies revealed that activating a mating goal was associated with men's propensity to risk-taking. Across a wide range of different risk-taking domains, a romantic motive increased men's reported willingness to take risks. In contrast, women's risk-taking was not affected by activating a mating motive. These findings suggest that risk-taking behavior has (in part) been evolved to enhance an individual's ability to attract a mate.

Keywords: risk-taking; mating goals; sex differences; sexual selection

The high prevalence rates of risk-taking behaviors, such as reckless driving, unprotected sex, alcohol consumption, extreme sports, and unhealthy lifestyles, has important psychological, health, and economic implications and is a topic of considerable scientific, societal, and political concern (Ben-Zur and Zeidner 2009; Reyna and Farley 2006). For example, risky driving has received public and scientific attention because of its role in motor vehicle collisions (Fischer et al. 2009). In the USA alone, in 2007, there were 10.6 million motor vehicle accidents, with 2.49 million individuals being injured, and a total of 41,059 people lost their lives (US Census Bureau 2010). Smoking cigarettes is another widespread burden that is closely associated with increased mortality rates. In the USA, more than 20% of youth in 9th through 12th grades are smoking cigarettes (Centers for Disease Control and Prevention, 2004). Likewise, alcohol problems are very common in the Western world: in Denmark, for instance, 60% of 15- and 16-year-olds reported to binge drink in the past 30 days (cited in Reyna and Farley 2006).

Obviously, risk-taking behavior may have considerable negative consequences in that health and well-being are harmed. Inasmuch as the fundamental human need for safety is threatened, risk-taking behaviors appear to be self-destructive and self-defeating. However, nearly no individual intentionally engages in self-defeating behaviors for the purpose of deliberate self-inflicted damage. Thus, engaging in risk-taking behavior appears to promise gains that outweigh its considerable losses

*Corresponding author. Email: tobias.greitemeyer@uibk.ac.at

(Baumeister and Scher 1988). In the current research, we examine the idea that the propensity to risk-taking has evolved because of its ability to serve a particular adaptive purpose, namely, to get access to potential mating partners. To test this notion, we draw on recent research showing that cues related to mating can serve to activate a mating goal and appear to facilitate perceptions, cognitions, and behaviors associated with reproductive success (Griskevicius, Cialdini, and Kenrick 2006; Griskevicius et al. 2007, 2009; Maner et al. 2005; Roney 2003; Wilson and Daly 2004).

An evolutionary account of risk-taking behavior

From an evolutionary perspective, human nature is (partly) the product of natural selection. Those traits and behaviors that aided our ancestors in surviving to reproductive age and reproducing became more common, whereas those traits and behaviors that hindered survival and reproduction became less common. In the evolutionary past, our ancestors were faced with a hazardous environment where they were forced to take great risks in order to find shelter, food, and sexual partners. Thus, individuals who played it safe, in that they did not take any risks at all, were unlikely to survive. From this view, risk-taking behavior is an inherited solution to enhance survival and reproduction. To be sure, pointless risk-taking did not and does not give a fitness advantage. Rather, risk-taking when the chances of gain are high should be favored by natural selection. In the present research, we propose that possible benefits in courtship may be such a gain that may evoke seemingly irrational risk-taking behavior.

Likewise, it is noteworthy that our modern world is strikingly different from our ancestral environment. At least in Western cultures, we are confronted with adaptive challenges that did not occur in the evolutionary past and therefore risk-taking behaviors may have been adaptive at earlier points in evolutionary history, but are no longer to be considered functional. However, humans spent most of their evolutionary history as hunter-gatherers so our primal instincts still exert a powerful influence over our behavior today, and current forms of risk-taking behavior, such as bungee jumping, taking psychoactive drugs, engaging in nonprotected sex, or reckless driving, may be a modern way how our genetic heritage is expressed.

In addition to the principles of natural selection, evolutionary theorists point to the importance of sexual selection in explaining change over time in organisms. According to sexual selection, not only traits and behaviors that enabled an organism to survive (natural selection), but also traits and behaviors that enabled an organism to attract mates become more common in successive generations of a population. According to Darwin, sexual selection takes two forms: intrasexual selection and intersexual selection. Intrasexual selection occurs when members of one sex compete among themselves for access to the other sex, whereas intersexual selection occurs when members of one sex choose an opposite-sex individual based on their preferences for particular traits in a mate.

From this perspective, the main function of risk-taking behavior is to enhance one's ability to attract a mate. It is important to note that this account does not only address risk-taking behavior that is directly related to gaining sexual access to the opposite-sex (such as sexual risk-taking or gambling), but may also generalize to domains that are unrelated to mate-seeking per se (such as reckless driving) but that are beneficial to one's reputation and thus enhances one's access to many mates

(e.g. males might try to impress potential female mating partners by risky driving maneuvers). That is, in line with costly signaling theory (Zahavi 1975), we propose that individuals may engage in risky behaviors that are potentially costly as a way of signaling to others that they possess desirable characteristics that could be passed onto offspring. In fact, females appear to be attracted by males' risk-taking. In one study (Kelly and Dunbar 2001), females rated the attractiveness of men who were either brave by taking physical risks or nonbrave by avoiding risk-taking. Results revealed that, as potential long-term mates, brave males were more attractive than nonbrave males. A similar study showed that females more than males preferred heroic risk takers as mates (Farthing 2005).

It is also noteworthy that the adaptive problem to attract a mate is different for women and men. According to Trivers' (1972) analysis of parental investment, the minimal investment required to produce an offspring is much greater for a female than for a male. Thus, men potentially can greatly increase their fitness by having sex with multiple partners, whereas women do not. As a consequence, there is greater variability in male reproductive success than female. Because of these different costs and benefits, females are assumed to be highly selective about their sex partners, whereas males have to compete with each other to be chosen by females. Thus, risky behavior appears to be more adaptive for males than for females in that they have more to gain and less to lose from risk-taking (Buss 2003; Eckel and Grossman 2002; Wilson and Daly 1985).

In fact, men more than women report a willingness to engage in a variety of risky behaviors (Gullone et al. 2000). They are more likely to be involved in fatal car crashes (Williams and Shabanova 2003), to use illegal drugs (Wilson and Daly 1985), die more often from drowning, or accidental poisoning throughout the Western world (Waldron, McCloskey, and Earle 2005), and report a greater willingness to engage in dangerous outdoor sports (Wilson et al. 1996) and unprotected sex (Poppen 1995) than do women. A meta-analysis (Byrnes, Miller, and Schafer 1999) combining 150 studies confirms these single findings: men were taking more risks overall and in a variety of domains than women.

From an evolutionary view, men are expected to take the greatest risks to gain sexual access to women when a man's reproductive competition with other men is most intense. This occurs in human males during the late teens and early 20s (Daly and Wilson 1988). Thus, the utility of male risk-taking is greater for young men than for older men. In fact, sex differences in risk-taking behavior are particularly pronounced in young adults. Young adults more than any other age group engage in risky behavior, such as unsafe sex (DiClemente, Forrest, and Mickler 1990), reckless driving (Tonkin 1987), and substance abuse (Arnett 1992), with young males being more prone to risk-taking than young females. The high level of young male risk-taking behavior has been even dubbed 'young male syndrome' (Wilson and Daly 1985), and being male appears to be the single largest demographic risk factor for early mortality in developed countries (Kruger and Nesse 2006).

Although the striking sex differences in human risk-taking and the fact that the peak age of male risk-taking corresponding to their peak reproductive years are consistent with an evolutionary approach to risk-taking, the question of cause and effect is still unknown. Inasmuch as one cannot experimentally manipulate the evolutionary pathway, it is unclear whether risk-taking behavior is in fact an adaptive solution to enhance one's mating success. However, if the propensity to risk-taking has evolved because of its benefit in courtship, cues designed to activate mating

motives may also trigger risk taking (Baker and Maner 2008, 2009). Indeed, it has been argued that mating goals are likely to be linked to adaptive outcomes (Bugental 2000; Kenrick, Li, and Butner 2003) and cues related to mating can serve to activate a mating goal and appear to facilitate perceptions, cognitions, and behaviors associated with reproductive success (Griskevicius, Cialdini, and Kenrick 2006; Griskevicius et al. 2007, 2009; Maner et al. 2005; Roney 2003). For instance, inducing mating goals leads men to engage in salient public displays, with men being more likely to engage in conspicuous consumption and women being more likely to engage in public charity (Griskevicius et al. 2007).

Based on this reasoning, if the propensity to risk-taking has evolved in part because of its benefit in courtship, cues designed to activate mating motives may also trigger risk-taking. Moreover, due to its beneficial effects on one's reputation even risk-taking behavior that is seemingly not linked to mating tactics (such as gambling or driving behavior) should be affected by the activation of a mating motive. However, inasmuch as risk-taking behavior appears to be more adaptive for males than for females, cues that prime romantic motives should increase men's, but not women's, inclination to engage in risk-taking behavior. There has been some evidence for the notion that activated mating cues are associated with increased men's, but not women's, risk-taking inclinations. It has been shown, for instance, that self-reported male (but not female) aggression (Griskevicius et al. 2009) and heroic altruism (Griskevicius et al. 2007) is triggered by activated mating motives. Even more relevant to the current research, sexual cues have been found to elicit self-reported male sexual decision-making (Ariely and Loewenstein 2006) and financial risk-taking (Baker and Maner 2008, 2009). The current research extends these previous investigations by examining the effects of mating cues on men's and women's propensity to risk-taking in a wide range of different risk-taking domains. Moreover, we were interested in whether activated mating motives increases male risk-taking even when the risky option is clearly inferior to the risk-avoiding alternative (see Experiment 2, reported below). In sum, in the current research, we focus on mating goals as potential gains that differently affect women's and men's propensity to risk-taking. We anticipated that activating a mating goal would increase men's, but not women's, risk-taking behavior.

Experiment 1: sexual risk-taking

Sexual risk-taking behavior has been shown to differ considerably among the sexes. Men are more likely to engage in casual sex (Hittner and Kryzanowski 2010), report a greater willingness to engage in unprotected sex (Poppen 1995), and are more likely to report multiple partnering than women (Boileau, Zunzunegui, and Rashed 2009). Moreover, sexual arousal is associated with increased male sexual decision-making (Ariely and Loewenstein 2006). However, insofar as Ariely and Loewenstein did not examine the effect of sexual arousal on female sexual decision-making, it is conceivable that risk-taking of both sexes (and not only of men as our theoretical analysis suggests) is increased after the activation of a mating motive. Thus, the aim of Experiment 1 was to examine the impact of activating a mating prime on both men's and women's propensity to sexual risk-taking. To induce a romantic mindset, participants were primed with photographs of highly attractive opposite-sex individuals and were then asked to report their intentions to engage in risky sex. It was predicted that the mating prime would have differential

effects on women's and men's intentions to engage in risky sex: whereas a mating prime should increase men's intentions to engage in risky sex (relative to a control prime), it should not affect women's risk-taking.

Method

Participants and design

Sixty-three students (mean age = 20.33) at the Ludwig–Maximilians-University in Munich, Germany took part in this experiment. For participation, course credit was given. All participants indicated having a heterosexual orientation. We employed a 2 (sex of participants) × 2 (prime: mating vs. control) between-participants design. Participants were randomly assigned to one of the experimental conditions. In the mating condition, there were 15 female respondents and 16 male respondents. In the control condition, there were 17 female respondents and 15 male respondents. Twenty-seven participants were currently in a relationship, whereas 36 were not.

Procedure and materials

When participants arrived at the laboratory, they were told that they were going to participate in two unrelated studies. The first study dealt with ratings of photographs for future studies, whereas the second study included survey questions about various preferences. Participants learned that for efficiency reasons and because both parts were very short, both studies would be performed together in one experimental session. This cover study was adapted from Griskevicius et al. (2007).

About half of the participants were exposed to mating-related cues, whereas the remaining participants were exposed to cues unrelated to mating. All materials were presented as part of a paper-and-pencil packet. In the mating prime condition, participants were primed with mating cues similar to those that have been used in previous research into the effects of romantic mating primes (Baker and Maner 2008; Griskevicius, Cialdini, and Kenrick 2006; Griskevicius et al. 2007; Wilson and Daly 2004). Participants received the photographs of three attractive opposite-sex individuals and were asked to select one person whom they thought was the most desirable romantic partner. The photographs were adapted from Greitemeyer (2007), who made sure that these individuals were rated as being highly attractive. After making this selection, they were asked to imagine that they were preparing to go on a first date with this person. They were then given up to 3 min to write about their idea of the perfect first date with this individual. In the control condition, participants saw a photo of a street with several buildings and were asked to imagine being on that street. They were given up to 3 min to write about their idea of the most pleasant weather condition. The control condition was successfully used in previous research (e.g. Griskevicius, Cialdini, and Kenrick 2006; Griskevicius et al. 2007).[1]

Then, participants reported their intentions to engage in risky sex. To assess intentions to engage in risky sex, participants responded to seven items (adapted from DeHart and Birkimer 1997). Sample items are 'If a person asserts me to have no sexual disease, I would not feel worried to have sexual intercourse with this person.' and 'If I find someone attractive, I would agree to sexual intercourse even if it is unprotected.' All items were assessed on a scale from 1 (*strongly disagree*) to 10 (*strongly agree*). These items were highly correlated and thus combined into a sexual risk-taking scale ($\alpha = 0.80$).

Finally, participants answered demographic questions, were thanked, probed for suspicion, and thoroughly debriefed. In debriefing, none of the participants indicated any suspicion that the two parts of the study were related. The same applies to the following experiments.

Results and discussion

The experiment was run by one female and one male experimenter. However, sex of the experimenter had no significant effect on the risk-taking scale and was not considered further. Sex of experimenter had also no significant effects in any of the following experiments.

Risk-taking

A 2 (sex of participants) × 2 prime (mating vs. control) analysis of variance (ANOVA), on ratings of reported sexual risk-taking, revealed a significant main effect for sex of participants, $F(1, 59) = 7.60$, $p < 0.01$, $\eta_p^2 = 0.11$. Male respondents ($M = 3.23$, SD = 1.37) reported being more likely than female respondents ($M = 2.52$, SD = 0.62) to engage in sexual risky behavior. More importantly, the interaction between sex of participants and prime was also significant, $F(1, 59) = 6.01$, $p < 0.05$, $\eta_p^2 = 0.09$ (see Figure 1). For male participants, it was predicted that the activation of a mating goal would increase sexual risk-taking. In fact, the mating prime ($M = 3.71$, SD = 1.57) significantly elevated men's reported sexual risk-taking relative to the control condition ($M = 2.71$, SD = 0.89), $t(29) = 2.17$, $p < 0.05$, $d = 0.78$. For female participants, in contrast, the activation of a mating goal did not affect sexual risk-taking, $t(30) = 1.10$, $p = 0.28$, $d = 0.39$: reported sexual risk-taking in the mating prime condition ($M = 2.39$, SD = 0.53) and the control condition ($M = 2.63$, SD = 0.69) was relatively similar. Finally, relationship status did not moderate the significant two-way interaction. The three-way interaction was not significant, $F(1, 55) = 1.82$, $p = 0.18$, $\eta_p^2 = 0.03$. Thus, relationship status was not assessed in any of the following studies.

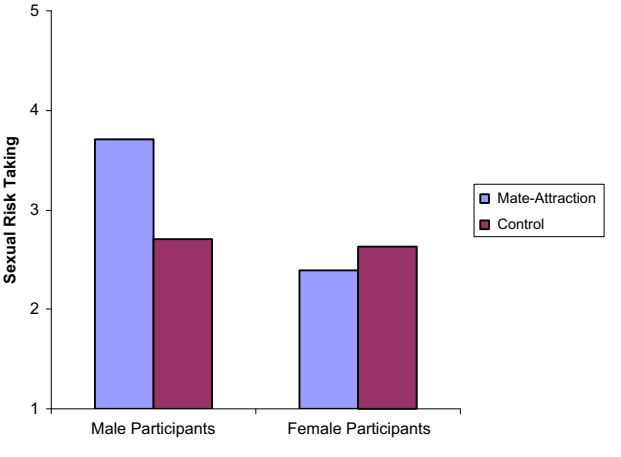

Figure 1. Sexual risk-taking as a function of participant sex and prime condition (Experiment 1).

To summarize, Experiment 1 provided initial evidence for the idea that activating a mating goal increases men's, but not women's, propensity to risk-taking. Thus, Experiment 1 extended Ariely and Loewenstein's (2006) finding that sexual arousal increases male sexual risk decision-making by showing that this effect is limited to men and does not generalize to women. A limitation of Experiment 1 was that only one domain of risk-taking was assessed. In addition, engaging in sexual risk-taking may directly fulfill a mating goal and thus the effects of priming a mating goal on men's risk-taking might be limited to risk-taking that is obviously related to mating goals. However, if one effect of risk-taking is to be beneficial in that one's reputation and thus one's access to mates is enhanced, then the activation of a mating motive should also increase men's risk-taking that has no clear links to romantic needs. In Study 2, this was addressed by assessing a different risk-taking domains (i.e. gambling behavior).

Experiment 2: gambling

Gambling behavior is another domain where there are considerable sex differences. In general, men are more likely to gamble than women (Downes et al. 1976). This sex difference is particularly increased if the stakes are high (Newman 1972). Previous research (Baker and Maner 2008) has shown that mating motivation is associated with risky decisions in a black jack task for men but not for women. In Baker and Maner's study, the risk (taking another card) and the risk-avoiding (do not take another card) choices were both equally reasonable. In Experiment 2, we extended this finding by examining whether activating a mating prime increases men's risky gambling propensity even when the risky choice is clearly inferior to the conservative choice. Our participants were given the choice to enter several lotteries. In each lottery, they had two choices. One (risky) choice involved a large return but the chance of winning was low, whereas the other (conservative) choice involved a low return but the chance of winning was high. Overall, the expected utility of the conservative choice was higher than the expected utility of the risky choice. We anticipated that a mating prime would increase men's propensity to select the risky choice, whereas women's risk-taking would be unaffected.

Method

Participants and design

Eighty-five students (mean age = 22.14) at the University of Sussex in Brighton, UK participated. We employed a 2 (sex of participants) × 2 (prime: mating vs. control) between-participants design. In the mating condition, there were 21 female respondents and 22 male respondents. In the control condition, there were 22 female respondents and 20 male respondents.

Procedure and materials

The procedure was similar to Experiment 1. However, rather than assessing participant's reported propensity to sexual risk-taking, risk-taking behavior in gambling was assessed. Participants were asked to imagine that they would have the opportunity to enter four lotteries. For each lottery, they were asked to select one of two

choices. One choice was risky; the alternative was a conservative choice. For instance, participants read that they could win either £100 with a 1 in 5 chance of winning (conservative) or £10,000 with a 1 in 1000 chance of winning (risky alternative). Note that the expected utility (attractiveness of the outcome multiplied by the probability of it being obtained) of the conservative option is £20, whereas the expected utility of the risky alternative is £10. Another lottery read: participants could either win £100 where one million people are entered and 50,000 winners are chosen (conservative option) or £500 where one million people are entered and 5000 winners are chosen (risky alternative). Again, from a rational point of view, the conservative option would be better than the risky alternative. Participant's choices of the risky alternative were added so that the risk-taking score ranged from 0 to 4.

Results and discussion

Risk-taking

A 2 (sex of participants) × 2 prime (mating vs. control) ANOVA, on risk-taking in gambling, revealed a marginally significant main effect for sex of participants, $F(1, 81) = 3.46$, $p = .07$, $\eta_p^2 = 0.04$. Male respondents ($M = 1.54$, SD = 0.34) tended to be more likely than female respondents ($M = 1.41$, SD = 0.31) to choose the riskier option. More importantly, the interaction between sex of participants and prime was significant, $F(1, 81) = 11.23$, $p < .01$, $\eta_p^2 = 0.12$ (see Figure 2). As predicted, the mating prime ($M = 1.66$, SD = 0.28) significantly elevated men's risky behavior compared with the control condition ($M = 1.40$, SD = 0.35), $t(40) = 2.61$, $p < .05$, $d = 0.82$. For female participants, the mating prime ($M = 1.31$, SD = 0.24) significantly decreased risk-taking behavior compared to the control condition ($M = 1.50$, SD = 0.35), $t(41) = 2.10$, $p < .05$, $d = 0.63$.

Experiment 2 conceptually replicated Experiment 1 and improves the generalizability of our findings. Inasmuch as gambling behavior is less obviously related to the fulfillment of a mating goal, we can be more confident that our findings are not limited to a specific group of risk-taking domains. Nevertheless, we aimed to

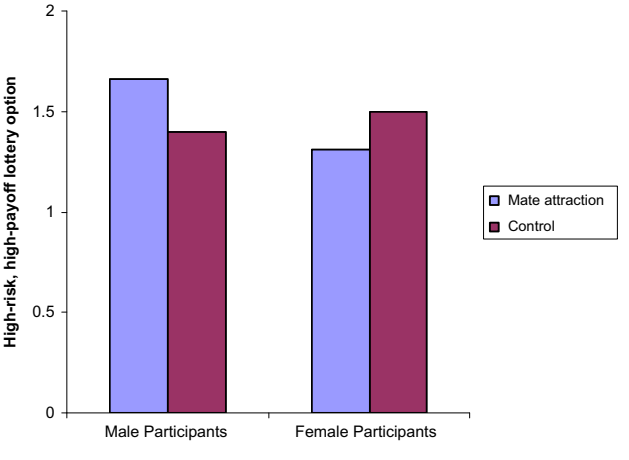

Figure 2. Gambling as a function of participant sex and prime condition (Experiment 2).

replicate our findings in a third experiment using a further risk-taking domain (i.e. reckless driving).

Experiment 2 also replicated and extended previous findings by Baker and Maner (2008) who found that male, but not female, risk-taking is increased after exposing them to attractive faces of the opposite sex. In contrast to Baker and Maner's research (where the risky and risk-avoiding choices were equally reasonable), in Experiment 2 the risk-avoiding choice was clearly superior to the risky choice in terms of the expected utility. Thus, from a pure economic point of view, the increased male risk-taking propensity in this study appears to be irrational. However, from an evolutionary point of view, even noneconomic risk-taking may be beneficial in that one's reputation and thus one's access to mates of the opposite sex is enhanced.

One limitation of Experiments 1 and 2 was that the mating prime did not clearly suggest whether the romantic relationship was limited to the short-term or may extend to the long-term. There has been considerable evidence that the magnitude of sex differences in mating strategies depends on whether a short-term or a long-term mate is pursued. If offspring result from a casual act of sexual intercourse, women risk a high investment if the father of their children may be unable or unwilling to invest in them or their offspring. In contrast, men invest practically nothing in an act of casual sex, and thus their risk is comparatively lower. Inasmuch as the cost-benefit ratio of pursuing a short-term sexual strategy is more positive for men than for women, females should be choosier than males in their selection of short-term mates. In contrast, given long-term strategy, not only the mother but also the father contributes significantly to their offspring. Thus, both women and men should be relatively choosy about the characteristics of a long-term mate. In fact, research has revealed that overall women have higher minimum selection standards than men. However, whereas women and men have similar standards given a long-term relationship, women more than men are selective when considering a short-term sexual partner (e.g. Buss and Schmitt 1993; Kenrick et al. 1993, 1990).

With regard to the effects of the activation of a mating goal, Griskevicius, Cialdini, and Kenrick (2006) have shown that whereas men displayed more creativity when primed with either a short-term or a long-term mating goal, women's display of creativity was enhanced only when primed with a long-term mating goal. On the other hand, other research (Griskevicius et al. 2007) revealed that short-term and long-term romantic motives affected displays of consumption and benevolence in a very similar fashion. Given that men's risk-taking is valued in both short-term and long-term mates (Kelly and Dunbar 2001), we anticipated that both mating primes would lead men to take higher risks (and do not affect women's risk-taking inclinations). Nevertheless, on an exploratory basis, we felt it an important endeavor to differentiate the effects of short-term vs. long-term mating primes on women's and men's risk-taking. This was done in Experiment 3.

Experiment 3: reckless driving

Experiment 3 extended Experiments 1 and 2 in some important ways. First, the effects of a mating prime on women's and men's reckless driving were examined. Men are more likely to engage in risky traffic behavior than women. For example, compared to women, men are less likely to use seat belts (Waldron, McCloskey, and Earle 2005), are less likely to comply with traffic rules (Yagil 1998), and are

more likely to run yellow lights (Konecni, Ebbesen, and Konecni 1976). Not surprisingly, men are nearly three times as likely as women to be involved in fatal car accidents (Arizona Department of Transportation Intermodal Transportation Division 2009). We anticipated that activating the goal to attract a mate would increase men's propensity to reckless driving, but would not affect women's reported reckless driving. Second, two mating prime conditions were employed (one short-term mating prime condition and one long-term mating prime condition). Third, participant's mood was assessed in order to examine whether our findings can be explained by differences in affective experience. Previous research has shown that positive mood decreases risk-taking (Isen and Patrick 1983), whereas negative mood increases risk-taking (Leith and Baumeister 1996). Thus, the mating primes may affect men's, but not women's, reported risk-taking because of distinct effects on men's and women's mood.

Method

Participants and design

One hundred and seventeen students (mean age = 21.53) at the University of Sussex in Brighton, UK participated. We employed a 2 (sex of participants) × 3 (prime: short-term mating vs. long-term-mating vs. control) between-participants design. In the short-term mating condition, there were 18 female respondents and 17 male respondents. In the long-term mating condition, there were 18 female respondents and 18 male respondents. In the control condition, there were 22 female respondents and 24 male respondents.

Procedure and materials

The procedure was similar to Experiments 1 and 2, with the following modifications. Whereas the control condition was the same as in Experiments 1 and 2, two mating prime conditions were realized that differed in level of involvement (short-term vs. long-term). In both conditions, participants were first asked to select one person (out of three attractive opposite-sex individuals) whom they thought was the most desirable romantic partner. In the short-term condition, participants were asked to imagine being about to go on a first date with this individual and to describe what the perfect first date with this person would be like, how they would feel before the date, where they would like to go, and how the date ideally would end. In the long-term condition, participants were asked to imagine being in a committed relationship with this individual for several years and to describe what a perfect holiday with this person would be like, where they would like to go, and how they would like to spend their time (adapted from Griskevicius, Cialdini, and Kenrick 2006).

After participants completed the positive and negative affect schedule (Watson, Clark, and Tellegen 1988), their proneness to react in a reckless and dangerous way to hypothetical driving scenarios was assessed. This scale was successfully employed in previous research (Taubman et al. 1999) and included 10 short stories describing conflicting driving situations. Sample situation:

> You are on your way to a weekend vacation. A very slow lorry is driving just in front of you. A continuous white line separates you and the other direction of the road. What do you think are the chances that you will go for an overtake?

For each scenario, responses were indicated on an 11-point scale, ranging from 0 (*0% of chances for behaving in the described way*) to 100 (*100% chance for behaving in the described way*). These 10 items were combined into a reckless driving scale ($\alpha = 0.83$).

Results and discussion

Risk-taking

A 2 (sex of participants) × 3 prime (short-term mating vs. long-term mating vs. control) ANOVA on reported intentions to drive recklessly revealed a significant main effect for sex of participants, $F(1, 111) = 76.13$, $p < .001$, $\eta_p^2 = 0.41$. Male respondents ($M = 46.20$, SD = 17.84) reported higher chances to drive recklessly than female respondents ($M = 25.69$, SD = 12.58). However, this main effect was qualified by the predicted interaction between sex of participants and prime, $F(2, 111) = 12.31$, $p < .001$, $\eta_p^2 = 0.18$ (see Figure 3). For male participants, it was predicted that both mating prime conditions would lead to higher chances of reckless driving than in the control condition. In fact, a planned contrast revealed that male participants in the mating prime conditions (short-term: $M = 56.33$, SD = 17.32; long-term: $M = 53.53$, SD = 13.65) reported higher chances to drive recklessly than male participants in the control condition ($M = 32.37$, SD = 11.83), $t(110) = 6.09$, $p < .001$. In contrast, reported chances to drive recklessly in the two mating prime conditions did not significantly differ, $t(110) = 0.61$, $p = .54$. For female participants, reported chances of reckless driving were relatively similar in the mating prime conditions (short-term: $M = 24.80$, SD = 13.27; long-term: $M = 24.41$, SD = 14.06) and the control condition ($M = 27.31$, SD = 11.20), $t(110) = 0.76$, $p = .45$.

Mood

To examine the possible role of mood in shaping the observed effects, two 2 (sex of participants) × 3 (prime) ANOVAs on positive and negative mood, respectively, were performed on the data. However, these analyses revealed no significant effects

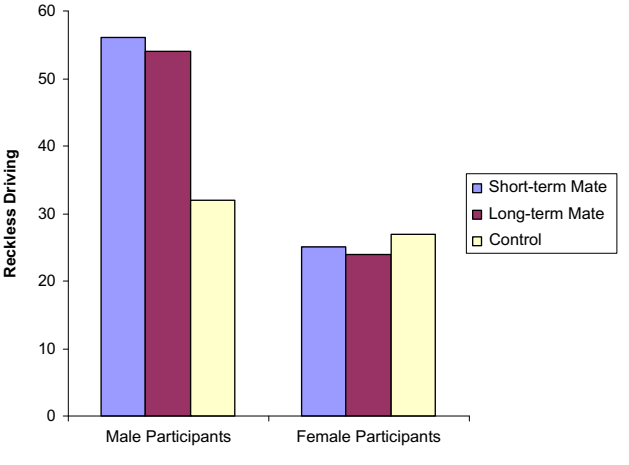

Figure 3. Reckless driving as a function of participant sex and prime condition (Experiment 3).

Table 1. Mean mood ratings (standard deviation in parentheses) as a function of participant sex and prime condition.

	Prime condition		
	Short-term	Long-term	Control
Experiment 3			
Positive mood			
Females	2.74 (0.98)	2.89 (0.57)	2.64 (0.88)
Males	2.62 (0.65)	2.65 (0.89)	2.76 (0.74)
Negative mood			
Females	1.41 (0.50)	1.63 (0.57)	1.57 (0.59)
Males	1.52 (0.66)	1.69 (0.63)	1.49 (0.60)
Experiment 4			
Positive mood			
Females	2.76 (1.10)	2.89 (0.59)	2.81 (0.88)
Males	2.59 (0.69)	2.54 (0.88)	2.69 (0.79)
Negative mood			
Females	1.37 (0.46)	1.66 (0.57)	1.49 (0.60)
Males	1.51 (0.66)	1.58 (0.54)	1.51 (0.66)

for sex of participants, prime, and the interaction, all Fs < 1.05 (see Table 1). In addition, when controlling for positive and negative mood, the interaction between sex of participants and prime on reported chances of reckless driving was still evident, $F(2, 109) = 11.33$, $p < .001$, $\eta_p^2 = 0.17$. Thus, different mood states are unlikely to account for the interplay of sex of participant and mating prime on reported risk-taking.

Taken together, the main finding from Experiments 1 and 2 was replicated in that the activation of a mating goal has differential effects of women's and men's propensity to risk-taking: whereas a mating cue increased men's reported chances of reckless driving, women's reported chances of reckless driving were unaffected. Our final experiment will further test the generalizability of the mating prime effect on women's and men's risk-taking across a wide variety of risk-taking domains. Experiment 3 revealed that both the short-term and the long-term mating prime increased men's, but did not affect women's, risk reported chances of reckless driving and that the different effects of an activation of a mating prime on women's and men's risk-taking cannot be explained by differences in mood states. However, because null findings are difficult to interpret, we felt it important to include both romantic scenarios and to control for mood in Experiment 4.

Experiment 4: different domains in risk-taking

Experiment 4 was a conceptual replication of Experiment 3. Its main aim was to investigate the generalizability of the mating prime effect on women's and men's risk-taking. This seems to be of interest because recent research (Hanoch, Johnson, and Wilke 2006) has highlighted the heterogeneity of individual's risk-taking behavior: an individual who exhibits high levels of risk-taking behavior in one domain (e.g. bungee jumpers taking recreational risks) may well exhibit moderate or low levels in other domains (e.g. financial decisions). Thus, in Experiment 4, participants responded to the revised form of the Domain-Specific Risk-Taking

(DOSPERT) scale (Blais and Weber 2006) that covers five different risk domains, namely, ethical, financial, health/safety, social, and recreational risks. It is also notable that responses on the DOSPERT scale have been shown to be associated with actual behavior on the corresponding risk domain (Weber, Blais, and Betz 2002).

Method

Participants and design

One hundred students (mean age = 21.75) at the University of Sussex in Brighton, UK participated. As in Experiment 2, we employed a 2 (sex of participants) × 3 (prime: short-term mating vs. long-term-mating vs. control) between-participants design. In the short-term mating condition, there were 14 female respondents and 16 male respondents. In the long-term mating condition, there were 17 female respondents and 16 male respondents. In the control condition, there were 19 female respondents and 18 male respondents.

Procedure and materials

The procedure was very similar to Experiment 3. However, a different risk-taking scale was used. Participants responded to the 30-item version of the revised DOSPERT Scale (Blais and Weber 2006). This scale assesses the likelihood with which respondents might engage in risky behaviors in five different domains (ethical, financial, health/safety, social, and recreational risks). Sample items are 'Passing off somebody else's work as your own.' (Ethical, $\alpha = 0.77$), 'Betting a day's income at the horse races.' (Financial, $\alpha = 0.84$), 'Sunbathing without sunscreen.' (Health/Safety, $\alpha = 0.82$), 'Admitting that your tastes are different from those of a friend.' (Social, $\alpha = 0.77$), and 'Going camping in the wilderness.' (Recreational, $\alpha = 0.88$). All items were assessed using a 7-point rating scale ranging from 1 (*Extremely Unlikely*) to 7 (*Extremely Likely*).

Results and discussion

Risk-taking

A total score of risk-taking was calculated by using the mean of the 30 risk-taking items ($\alpha = 0.87$). This score was subjected to a 2 (sex of participants) × 3 prime (short-term mating vs. long-term mating vs. control) ANOVA. Male respondents ($M = 3.95$, SD = 0.81) reported being more likely to engage in risky behavior than female respondents ($M = 3.11$, SD = 0.53), $F(1, 94) = 48.88$, $p < .001$, $\eta_p^2 = 0.34$. More importantly, however, the predicted interaction between sex of participants and prime was significant, $F(2, 94) = 7.46$, $p < .01$, $\eta_p^2 = 0.14$ (see Figure 4). For male participants, a planned contrast revealed that reported intentions to take risks were higher in the mating prime conditions (short-term: $M = 4.30$, SD = 0.69; long-term: $M = 4.28$, SD = 0.52) than in the control condition ($M = 3.36$, SD = 0.81), $t(94) = 5.12$, $p < .001$. In contrast, reported intentions to take risks in the two mating prime conditions did not significantly differ, $t(94) = 0.01$, $p = .92$. For female participants, reported intentions to take risks did not differ between the mating prime conditions (short-term: $M = 3.05$, SD = 0.55; long-term: $M = 3.13$, SD = 0.58) and the control condition ($M = 3.15$, SD = 0.55), $t(94) = 0.32$, $p = .75$.

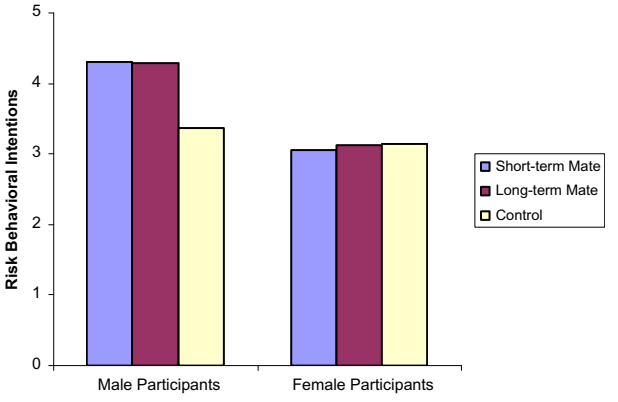

Figure 4. Risk-taking propensity as a function of participant sex and prime condition (Experiment 4).

Table 2. Mean reported intentions (standard deviation in parentheses) to take risks as a function of participant sex and prime condition (Experiment 4).

	Prime condition		
	Short-term	Long-term	Control
Ethical			
Females	1.95 (0.61)	2.71 (0.83)	2.18 (0.60)
Males	3.69 (1.26)	3.43 (1.19)	2.89 (1.01)
Social			
Females	4.20 (1.12)	4.37 (1.13)	4.73 (1.10)
Males	4.90 (0.99)	4.80 (0.73)	4.20 (1.42)
Financial			
Females	2.93 (1.17)	2.09 (0.80)	2.32 (0.80)
Males	3.84 (1.38)	3.71 (0.94)	2.64 (1.40)
Health			
Females	2.89 (1.14)	3.04 (1.02)	3.12 (1.03)
Males	4.69 (1.31)	4.51 (1.27)	3.36 (1.30)
Recreational			
Females	3.26 (1.22)	3.44 (1.50)	3.39 (1.37)
Males	4.39 (1.47)	4.95 (1.26)	3.69 (1.47)

Planned contrasts on the responses to the domain-specific subscales were performed next (see Table 2). In all risk domains, men's reported intentions to take risks were higher in the mating prime conditions than in the control condition, all ts $(94) > 1.98$, all ps $< .06$. In addition, men's reported intentions to take risks in the two mating prime conditions did not significantly differ, all ts$(94) < 1.15$, all ps $> .25$. Finally, women's reported intentions to take risks did not differ between the mating prime conditions and the control condition, all ts$(94) < 1.37$, all ps $> .17$.

Mood

As in Experiment 3, there were no significant effects for sex of participants, prime, and the interaction on mood, all Fs < 1.60 (see Table 1). In addition, when control-

ling for positive and negative mood, the interaction between sex of participants and prime on the total score of intentions to take risks remained significant, $F(2, 92) = 7.30$, $p < .01$, $\eta_p^2 = 0.14$. The effects of sex of participants and prime on the risk subscales were also unaffected by mood.

To summarize, Experiment 4 replicated the previous experiments in that the activation of a mating goal increased men's propensity to risk-taking. In contrast, women's propensity to risk-taking was not affected by the mating cue. As in Experiment 3, in both the short-term and the long-term mating condition, men's risk-taking propensity was increased and once again mood did not account for our findings. As noted above, null findings are difficult to interpret. Thus, it may be that our involvement manipulation (short-term vs. long-term) was simply not strong enough to elicit distinct effects on men's risk-taking behavior. Although we adapted a procedure that has been successfully employed in previous research (Griskevicius, Cialdini, and Kenrick 2006), this possibility should be acknowledged.

It is noteworthy that overall – when considering the control condition only – male respondents reported to be more likely to engage in risky behavior than female respondents, but women more than men were prone to risk-taking behavior in the social domain. This finding is in line with previous research showing that men indicate a greater likelihood of engaging in risky behaviors when making financial, health/safety, recreational, or ethical decisions than do women, but women more than men tend to be risk-seeking in the social domain (Johnson, Wilke, and Weber 2004; Weber, Blais, and Betz 2002).

General discussion

The current research tested an evolutionary account of human risk-taking. According to this view, human risk-taking may be linked to evolutionary processes of sexual selection in that risk-taking behavior has (in part) been evolved because it enhances an individual's ability to attract a mate. Because men have a lower level of initial obligatory parental investment than women, men tend to be less selective in choosing their mates. Thus, the desirability of risk-taking in a mate differs for women and men. Whereas women are more likely than men to prefer willingness to take risks in a mate (Kelly and Dunbar 2001), men may be more likely to display risk-taking behaviors than women when motivated to attract a mate. In fact, the current four experiments revealed that inducing a mating motive increased men's, but not women's, propensity to risk-taking (Ariely and Loewenstein 2006; Baker and Maner 2008, 2009). This finding occurred across a wide range of different risk-taking domains (sexual, gambling, reckless driving, ethical, financial, health/safety, social, and recreational risks) and cannot be explained by differences in reported mood. Moreover, this effect occurred although there being no actual incentive for men to appear riskier because the romantic cues were photographs, and participants could not actually impress a romantic partner with their risk taking. Finally, it is noteworthy that the activation of a mating motive increased men's risk-taking that has no clear links to romantic needs (e.g. gambling, risky driving, etc.). This is fully in line with our reasoning that one effect of men's risk-taking is to improve one's reputation and thus enhances one's access to mates.

Of course, there are other theoretical approaches that address sex differences in risk-taking. For instance, Slovic, Fischhoff, and Lichtenstein (2000) have argued that men more than women are familiar with various risk-domains and this increased

familiarity with a risk is associated with reduced risk-perceptions. Other theorists have focused on the importance of sociocultural factors in explaining risk-taking behaviors. Most cultures value characteristics that are associated with risk-taking behavior, such as courage and bravery, and these attributes appear to be more rewarding for men than for women. Men, at least in Western cultures, are socialized to be more risk-oriented than women (Kelling, Zerkes, and Myerowitz 1976), and risk-taking appears to be a central characteristic of the psychology of men (Wilson and Daly 1985). Finally, risk-taking behavior can be a source of excitement and arousal (Zuckerman 1979) and may involve the benefit of social recognition. We acknowledge the importance of all these accounts in explaining sex differences in risk-taking. In fact, we believe that the evolutionary account complements rather than contradicts previous theoretical work. Nevertheless, we feel that an evolutionary account is most well-suited to address the main current finding that men, but not women, are more prone to risk-taking after a romantic motive has been induced.

Although we advance an evolutionary account to address underlying motives of human risk-taking behavior, we do not claim that risk-taking behavior has to be functional in that it currently enhances biological fitness. Men's risk-taking may have long-term benefits, such as that women are more likely to date risk-taking men. In fact, previous research has shown that heroic men are preferred as mates (Farthing 2005; Kelly and Dunbar 2001). However, it may well be that the costs of male risk-taking behavior outweigh its potential long-term benefits. For instance, Experiment 3 showed that inducing a mating motive increased men's propensity to reckless driving, which affects the likelihood of being a victim of fatal car accidents. Likewise, in Experiment 2 after inducing a mating motive, male participants were more likely to choose the risky gambling option, which offered a lower expected utility than the conservative gambling alternative. Inasmuch as our modern world differs profoundly from ancestral environments, men's risk-taking may indeed lead to fitness-reducing, rather than fitness-enhancing, outcomes. Likewise, it should be noted that different risk-taking behaviors differ in their extent to which they increase an individual's likelihood to survive and pass on her/his genes: risk-taking where there are potential gains to be made that would warrant potential risks would be more adaptive than risk-taking where there are few potential gains that would warrant potential risks. Future research may examine whether the activation of a mating motive also increases foolish, reckless, and needlessly risky decisions that clearly jeopardize one's physical safety.

Future research should also address some important limitations of the current research. First, risk-taking was assessed by employing self-report measures. Such measures are potentially problematic in different respects. For one, it is doubtful that individuals have full access to their cognitive processes (Nisbett and Wilson 1977) so some readers may wonder to what extent real-life risk-taking behavior corresponds to responses to self-report measures. Moreover, self-report measures are relatively transparent to participants, easy to fake and thus raise concern about suspicion and demand characteristics. Note, however, that self-report measures have their merits and appear to be a reliable and valid method to assess risk-taking behavior (e.g. Laapotti, Keskinen, and Rajalin 2003; Schwebel et al. 2006). Nevertheless, a multi-method measurement approach by using behavioral observation of real-life risk-taking behavior would fruitfully complement the present research.

Second, the present research provides consistent evidence for the hypothesis that mating primes increase men's propensity to risky behavior, but remain mute in

terms of its underlying mechanisms. Studies 3 and 4 ruled out the notion that differences in mood account for the effect of mating primes on men's risk-taking behavior. But how, then, do mating primes increase men's propensity to risk-taking? One possibility is that the activation of a mating motive increases the accessibility of risk-related cognitions, which, in turn, evokes risky behavior. It may also be that when men were primed with a mating motive, this suppresses how vulnerable they feel they are to the negative side effects of risk-taking behavior. For instance, they may feel like they are less vulnerable to contracting a sexually transmitted disease when primed with mating, which may underlie the finding that mating primes increase men's propensity to sexual risk-taking. Testing these predictions is an important endeavor for further research.

Third, we did not assess preexisting risk-related attitudes, such as trait risk propensity or sensation seeking, prior to the mating prime. Inasmuch as participants were randomly assigned to the experimental conditions, it should be ensured that participants in the mating prime and the control condition do not differ on individual differences in trait risk-taking. Nevertheless, future research might examine whether the effect that men's propensity to risk-taking is increased after activating of a mating motive is reliable for both people high and low in trait risk-propensity.

Fourth, it is noteworthy that there is no real variation of the independent variable throughout the research. That is, we relied on one manipulation that has been successfully employed in past research. Future research may vary the mating manipulation, such as activating implicitly mental representations associated with mating (Maner, Gailliot, and Miller 2009), which may increase the generalizability of our findings.

A further limitation involves the sole use of college students as participants. That is, all participants of the present studies were relatively young adults. As noted above, differences in risk-taking behavior among the sexes are most pronounced in young adults when the reproductive competition is most intense. Future research examining a wider age span would be informative whether the activation of a mating goal does not only increase young men's but also older men's propensity to risk-taking.

We argued that processes of sexual selection underlie (in part) male risk-taking behavior. As noted above, sexual selection takes two major forms: intrasexual selection and intersexual selection. So far, it is unknown which of these forms enhance men's propensity to risk-taking. It may be that male risk-taking behavior is directed toward other men in that it serves as a communicative function that one possesses the ability to compete successfully with other males to be chosen by females (intrasexual selection). But it may also be that male risk-taking behavior is directed toward women in that it signals that one possesses desirable traits that could be passed onto offspring (intersexual selection). This is another important avenue for future research.

Conclusion

We began this article by pointing to the high prevalence rates of risk-taking behaviors in young men. Attracting the opposite sex appears to be such a powerful motive that men (more or less consciously) hazard the inherent dangers of high-risk behavior. It seems that adaptations that solve problems of reproduction sometimes come with a prize.

Note

1. It might be that our mating prime manipulation does not only activate mating goals but also influences participant's arousal (which, in turn, might drive the effect on risk-taking behavior). To rule out this alternative explanation for our proposed effects, a pilot study was conducted. Thirty-seven participants (mean age = 25.38) were randomly assigned to either the mating prime or the control condition. Participants were from the same participant pool as in Experiment 1 (German students, Ludwig–Maximilians-University, Munich, Germany). In the mating condition, there were eight female respondents and nine male respondents. In the control condition, there were 10 female respondents and 10 male respondents. After the experimental variation, all participants were asked to what extent they feel aroused, on a scale from 1 (*not at all*) to 10 (*very much*). Results revealed a non-significant effect of prime on arousal, $F(1, 33) = .12$, $p = .73$, $\eta_p^2 = .00$. Moreover, neither the main effect of participant sex, $F(1, 33) = .00$, $p = 1.00$, $\eta_p^2 = .00$, nor the interaction approached significance, $F(1, 33) = 0.09$, $p = .76$, $\eta_p^2 = .00$ (female mating: $M = 4.88$; female neutral: $M = 4.90$; male mating: $M = 4.67$; and male neutral: $M = 5.10$). Thus, it is unlikely that differences in arousal underlie any effects of the activation of a mating goal on risk-taking behavior.

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