

Sex, Love, Temptation:
Human Mating Motives and their Regulation

Jon K. Maner
Florida State University

Correspondence to:

Jon Maner

Dept of Psychology

Florida State University

maner@psy.fsu.edu

Sex, Love, Temptation:
Human Mating Motives and their Regulation

Sex and relationships are a central part of human life. Indeed, when 4000 young men and women were asked the question: “Did you think about sex or were your thoughts sexually colored even for a moment during the last 5 minutes?” the results were quite telling. Five out of ten men said yes, as did four out of ten women (Cameron & Biber, 1973).

From the perspective of evolutionary biology, this should come as no surprise. The engine that drives biological evolution is differential reproductive success – some members of a species are better able than other members to reproduce their genes. And the primary means through which people transmit their genes into the next generation is through sex. As a result, people, like members of other sexually reproducing species, are powerfully motivated to play and succeed at “the mating game.” Indeed, at a fundamental level, people’s bodies, minds, and nervous systems are built to form sexual and romantic relationships.

Yet, forming a relationship is just the start. People also spend a tremendous amount of energy maintaining and protecting long-term committed relationships. This is a big difference between humans and chimpanzees, who tend to engage primarily in non-dyadic relationships with little promise of commitment (Tutin, 1979). Successfully maintaining a relationship into the long-term requires people to overcome a number of substantial challenges, not the least of which is avoiding temptations posed by desirable

alternatives to one's long-term partner. To help solve these challenges, people possess a variety of adaptive psychological and physiological mechanisms designed to help them overcome the obstacles that stand in the way of maintaining a successful long-term relationship. Powerful motives help people regulate their mating behavior in the face of tempting alternatives.

This chapter describes recent evidence for the role that biologically based motivational systems play in forming and maintaining sexual and romantic relationships. The chapter will describe recent evidence for some of the motivational processes that help people solve challenges associated with romantic attraction (e.g., seeking new partners; identifying the most desirable partners) and relationship maintenance (e.g., avoiding the temptation of romantic alternatives). The chapter will also discuss emerging lines of research that take an interdisciplinary approach to identify basic perceptual mechanisms (e.g., attention) and physiological mechanisms (e.g., hormones) that help people solve those important relationship challenges.

The Sights of Sexual Attraction

Sexual Motives and Attention to Possible Mates

Think back to the last time you walked across a college campus or down a crowded city street. Did you find yourself looking at some people more than others, and were there some people in particular you could now pick out of a line-up? Are the answers to these questions determined merely by random characteristics of the people

you passed? Or, instead, are the ways we selectively attend to others possibly linked to important underlying motivations, including those involved in mating?

Several recent studies on mating and attention have tested the hypothesis that mating motives lead perceivers to attend preferentially to phenotypic cues in other people that signal the presence of desirable mating-related traits. For example, some cues that signal a variety of reproductively important traits are also associated with judgments of physical attractiveness. Physical attractiveness has received a lot of attention in the evolutionary psychology literature because attractiveness can signal characteristics that are relevant to a person's level of reproductive fitness. Highly symmetrical people, for instance, are typically judged to be physically attractive, and symmetry can signal the presence of a strong immune system and a person's overall level of genetic fitness (e.g., Gangestad & Simpson, 2000). As such, physical attractiveness often is integrated into theories of "good genes" sexual selection. Indeed, women, particularly those pursuing a short-term sexual strategy, have a preference for physically attractive men in part because male physical attractiveness is a potential sign of high genetic fitness. Mating with an attractive man should increase the likelihood that a woman will, in turn, have more genetically fit offspring (e.g., Scheib, Gangestad, & Thornhill, 1999). For example, Fisher (1958) proposed the 'sexy sons hypothesis': When a woman mates with a highly attractive man, she increases the likelihood of bearing a son who could prove particularly attractive to women, and who would thus enjoy greater access to potential mates. Moreover, a man's physical attractiveness often signals his level of social dominance (e.g., via markers of testosterone; Cunningham, Barbee, & Pike, 1990), and women tend to prioritize dominance in their male partners (Buss, 1989).¹

In addition, characteristics such as health and fertility, which are related to perceptions of female attractiveness, may signal a woman's "reproductive value" (biologically speaking) (Buss & Schmitt, 1993). From an evolutionary perspective, men have an evolved preference for healthy, fertile mates because such a preference would have increased the likelihood that a male ancestor would have fathered healthy offspring and, in turn, successfully passed his genes on to subsequent generations (Kenrick & Keefe, 1992; Singh, 1993). In summary, both men and women tend to prefer physically attractive partners (compared to less attractive ones).

Because physical attractiveness is highly valued in mating-related contexts and because it is an easily and rapidly recognizable stimulus characteristic (relative to other kinds of characteristics such as kindness or sense of humor), we have hypothesized that people possess psychological mechanisms that lead them to selectively attend to highly attractive individuals (Maner, Gailliot, Rouby & Miller, 2007; Maner et al., 2003). That is, mating motives may lead people to become visually attuned to physically attractive members of the opposite sex. Moreover, we have hypothesized that these attunements should be observed at early and automatic stages of visual perception.

Several studies have provided support for this hypothesis. In an eye-tracking study, for example, undergraduate participants were presented with arrays of male and female faces that varied in their level of physical attractiveness. We found that both men and women gazed more intently on opposite sex faces that were highly attractive, as compared to those that were less attractive (Maner et al., 2003). This attentional bias was especially strong among single people and people who were sexually unrestricted (i.e., individuals who tend to have strong interest in casual sexual partnerships and who place

the greatest premium on physical attractiveness; see Simpson & Gangestad, 1991). Thus, attention to attractive opposite sex targets was especially strong among people with the most to gain from quickly identifying prospective partners.

Moreover, these attentional biases translated into subsequent frequency estimation biases. That is, after quickly viewing arrays consisting of 50% attractive faces and 50% average faces, people thought there were more attractive faces than average-looking faces. This bias presumably was partially a result of participants allocating a disproportionate amount of their attention toward the attractive faces. This sort of frequency estimation bias could have important consequences for relationship decisions. Thinking there are more highly attractive people in the local community than there really are, for instance, could lead people to develop unrealistically high standards for their romantic partners, and could even reduce people's commitment to a current relationship (Kenrick, Neuberg, Zierk, & Krones, 1994).

Examining lower-order cognitive processes such as attention can also help test sex differences in the characteristics men and women prioritize in a potential romantic partner. Although physical attractiveness is valued by both men and women, for example, other characteristics such as kindness, intelligence, sense of humor, and social status all play an important role, as well. But how do men and women differ in their prioritization of these traits? One recent study presented men and women with pictures of people that varied independently in their level of attractiveness and social status (some were nicely dressed; others were dressed rather shabbily). While participants gazed at the people, their eye movements were tracked. The findings suggested that whereas men were inclined to look preferentially at the women who were physically attractive, women

instead attended preferentially to men who displayed signs of social status, rather than attractiveness (Maner, DeWall, & Gailliot, 2008). Thus, in this study, status seemed to trump physical attractiveness for female perceivers. This finding fits with a large evolutionary literature suggesting particular benefits to women who form long-term relationships with high status men (e.g., greater access to resources for themselves and their offspring; Buss & Schmitt, 1993; Sadalla, Kenrick, & Vershure, 1987).

The research described thus far in this section presumes that attunement to other people is caused, at least in part, by the presence of mating motivation – a desire to find a mate and form a romantic partnership. Such studies presume that some level of mating motivation is chronically active. Mating-related cognition, however, is also highly responsive to temporarily activated motivational states. To test the hypothesis that activated mating motives would increase attention to prospective mates, Maner, Gailliot, Rouby, and Miller (2007) primed people with a mating motive and then examined attentional biases toward attractive opposite sex faces. They examined the extent to which attention would “stick” on particular faces, such that people would be less efficient at pulling their attention away – a phenomenon we have referred to as “attentional adhesion.”

In one study, people wrote a short essay about a time in which they were sexually and romantically aroused. In a second study, people unscrambled sentences that contained mating-related words (e.g., kiss, love, lust, erotic). In both cases, the mating prime increased participants’ attentional adhesion to attractive opposite sex faces (and only those faces). Moreover, those effects were most pronounced among sexually unrestricted participants – individuals who are interested in casual sexual partnerships

and who are therefore most inclined to view attractive strangers as desirable and immediate mating opportunities. Thus, when unrestricted people had a mating motive experimentally activated, their attention was quickly, powerfully, and automatically captured by attractive images of the opposite sex. Mating related motives caused attractive faces to become magnetic, in the sense that they captured and held people's attention. Notably, those attentional biases were present at an early stage of perceptual processing: attentional adhesion was observed after participants had seen each face for only 500 milliseconds (half a second). People were able to detect a person's attractiveness literally in the blink of an eye and highly attractive targets captured people's attention without enough time for much conscious control.

Other work from our lab (Maner, Gailliot, & Miller, 2009) has demonstrated that even when the motivational prime itself occurs outside of conscious awareness, mating motives direct attention toward attractive members of the opposite sex. In one study, participants first viewed a number of mating-related words (e.g., kiss, lust) at a speed too quick to be consciously processed (40ms). In a control condition, participants viewed neutral words at a similar speed. In a second study, people performed an implicit priming procedure in which they unscrambled sets of words to form sentences. Some of the sets of words included mating-related words; others did not. In response to these implicit mating primes, single participants (but not participants already committed to a current romantic partner, a point to which I return later) had their attention more powerfully captured by images of attractive opposite sex targets. Thus, even when people were unaware of the source of their mating motivation, they still attended powerfully to prospective mates.

Other intriguing evidence for mating-related attentional biases comes from research examining psychological changes across women's menstrual cycle. A woman's level of fertility fluctuates dramatically throughout her menstrual cycle. Typically, there are only a few days in a woman's cycle when sexual intercourse can result in fertilization of an egg – the few days before ovulation (the late follicular phase) and the day of ovulation itself (Wilcox, Weinberg, & Baird, 1995). Outside this brief window, the probability of conception is very low. Thus, the period surrounding ovulation is extremely important from a reproductive standpoint, because it represents the peak period of a woman's reproductive fertility.

Anderson and colleagues (2010) applied this literature to study attentional changes across women's menstrual cycle. They asked naturally cycling female participants to view arrays of male faces while the focus of women's attention was surreptitiously recorded with an eye-tracker. Findings demonstrated that when women were ovulating, and thus were highly fertile, they attended more to the highly attractive male targets. Moreover, Laeng & Falkenberg (2007) had normally cycling women look at pictures of their male partners at different points in their cycle. The researchers found that when viewing their male partners during the fertile part of their cycle (as compared to the non-fertile parts of their cycle), women had an increase in pupil diameter size – an indicator of heightened visual attention. These findings hint at the intriguing possibility that basic physiological states related to female fertility attune women's perceptual systems to desirable mating-related traits in men – both their long-term partners and new potential mates.

Inattention to Attractive Alternatives

Although paying close attention to highly attractive members of the opposite sex can help people identify and procure a new partner, it can also spell disaster for a current long-term relationship. Indeed, a primary threat to close relationships is the temptation of relationship alternatives (i.e., opposite-sex individuals who may tempt one away from a current relationship), and infidelity is one of the most consistent predictors of divorce (Amoto & Rogers, 1997). Relationship alternatives who are physically attractive are particularly threatening to a relationship, as physical attractiveness is highly valued in extra-pair partners (e.g., Gangestad & Thornhill, 1997; Haselton & Gangestad, 2006). Consequently, attending to alternative partners can undermine a person's commitment to a current relationship (Kenrick et al., 1994). Indeed, people perceive in long-term relationships perceive desirable relationship alternatives as basic threats to their relationship (Plant, Kunstman, & Maner, 2010).

Many people are highly motivated to protect their long-term relationships. IN particular, studies suggest that people are highly motivated to respond to desirable relationship alternatives in ways designed to downregulate the threats they pose to relationship maintenance. For example, individuals who are in committed romantic relationships often “devalue” alternative partners – they judge alternatives as being less attractive than single people do (Johnson & Rusbult, 1989; Simpson et al., 1990; Lydon, Meana, Sepinwall, Richards, Mayman, 1999). Negative evaluations of alternative partners can help people stay committed to their current partner.

Some research suggests that limiting one's attention to attractive alternatives can enhance relationship success. Miller (1997) asked participants in romantic relationships

to inspect an array of magazine photographs that included images of physically attractive members of the opposite sex. Compared with participants who spent a lot of time gazing at the attractive opposite sex photos, participants who chose to spend less time looking at those photos reported greater relationship adjustment and satisfaction, and were less likely to have broken up, at two-month follow-up.

Work from our own lab suggests that, even at early stages of perceptual processing, the desire to maintain a long-term relationship reduces people's attention to desirable romantic alternatives. For example, in one set of studies, people were primed with a mating motive and their attention to attractive opposite sex targets was assessed with the dot probe task (Maner, Gailliot, & Miller, 2009). As described earlier in the chapter, this task measures early-stage attentional biases. In one study, participants were primed with mating words (or neutral control words) at the edge of visual perception (40 ms presentation). In a second study, participants were primed using a sentence unscrambling task; some of the sentences contained mating related priming words (or neutral words in the control condition). Regardless of how they were primed, single participants responded by paying more attention to attractive members of the opposite sex; their attention was quickly and automatically captured by images of prospective mates.

A very different pattern, however, emerged for participants who were already in a relationship. When committed participants were primed with a mating motive, they paid less attention, not more, to images of highly attractive opposite sex targets. At an early stage of visual attention, their attention was powerfully repelled by those members of the opposite sex who pose the greatest threat to relationship commitment.

In another study, we sought to directly activate in committed participants a relationship maintenance motive (Maner, Rouby, & Gonzaga, 2008). After arriving at the lab, participants – all of whom were in a committed long-term relationship – performed a priming task intended to activate a relationship maintenance motive: They were assigned to write a short autobiographical essay about an instance in which they felt strong feelings of romantic love for their partner (versus a neutral topic in the control condition). Feelings of romantic love are intimately linked with relationship maintenance and they motivate people to engage in strategies aimed at maintaining and protecting their long-term relationship (Diamond, 2004; Diamond & Dickenson, 2012; Gonzaga et al., 2001). Indeed, evolutionary theories suggest that love is a key affective mechanism that underlies long-term pair bonding (Buss, 1988b; Frank, 1988).

After undergoing the priming procedure, participants completed the dot probe attention task. Findings demonstrated that participants who had written the romantic love priming essay (compared to those who had not) displayed substantially less attention to images of attractive opposite sex targets. No such effect was found for other types of targets; this speaks to the specificity and the function of the effect. Being primed with a relationship maintenance motive (via feelings of romantic love) led people's attention to be automatically repelled by desirable alternatives to their current relationship partner.

Thus, people tend to be highly motivated to maintain and protect their long-term relationships from the threats posed by attractive relationship alternatives. At the level of basic perceptual processing (e.g., attending away from alternative partners) and at higher order stages of cognition (e.g., devaluing alternative partners), people display a variety of responses aimed at helping them resist temptation.

When Inattention to Relationship Alternatives Backfires

Although attending away from desirable relationship alternatives is likely to safeguard people's commitment, one recent set of studies suggests an important exception to the general rule that less attention to attractive relationship alternatives is good for relationships (DeWall, Maner, Deckman, & Rouby, 2011). In three experiments, DeWall and colleagues brought romantically committed participants into the lab, and subtly directed their attention away from images of attractive relationship alternatives. They used an attention modification task designed to limit people's attention to attractive alternatives without participants realizing that their attention had been manipulated. The task was a modified version of the dot probe task, in which two opposite-sex target photos (one highly attractive and one average-looking) were presented on a computer monitor. The researchers subtly manipulated the proportion of trials on which the task required participants to attend to the location of the attractive images versus the less attractive images. In the experimental condition, the task required participants to attend away from the images of attractive opposite sex targets on the majority of the trials, thus limiting their attention to attractive relationship alternatives. That is, on about 80% of the trials, participants needed to look away from the highly attractive opposite sex image and toward the average looking image. Importantly, at no point did the experimenter explicitly instruct participants to attend away from the attractive images; instead, the task limited participants' attention to attractive alternatives without any awareness that their attention had been constrained.

Across the three experiments, results indicated that manipulating people's attention away from relationship alternatives had the effect of turning those alternatives

into “forbidden fruit.” That is, just as people want jobs they cannot have, salaries they cannot earn, and cars they cannot afford, when people were placed in situations that limited their ability to attend to attractive alternatives, those people ended up desiring attractive relationship alternatives even more, and desiring their current relationship partner even less. This general pattern was observed across a number of different dependent variables. Subtly limiting people’s attention to attractive alternatives reduced their self-report level of relationship satisfaction and commitment and it increased their positive attitudes toward infidelity. It enhanced their memory for attractive relationship alternatives in a recognition memory experiment: after having their attention directed away from attractive alternatives, people ended up remembering those alternatives even better. And, finally, limiting people’s attention ended up increasing their attention to attractive alternatives at a subsequent stage of the experiment, thus producing a rebound effect.

These findings are consistent with reactance theory (Brehm, 1966), which posits that people respond forcefully to threats to their own liberty by doubling their efforts to maintain their sense of freedom and autonomy. Our findings are also consistent with a small number of studies suggesting that reactance can occur even when people are not aware that their freedom has been limited. For example, when participants were subliminally primed with the name of a relationship partner who limits their freedom, they rebelled and pursued a goal that ran counter to the partner’s wishes (Chartrand, Dalton, & Fitzsimons, 2007). The studies of DeWall and colleagues demonstrate that when situational demands implicitly prevented committed participants from attending to attractive relationship alternatives, those alternatives become even more enticing.

Thus, the existing literature on mating and attention suggests that, although attending to desirable relationship alternatives can be harmful, so too can attending away from attractive alternatives, at least when that inattention is demanded by the situation. Being told simply not to look is probably not an effective strategy for boosting satisfaction and commitment or reducing interest in alternatives. To be sure, spending most of one's time attending to attractive alternatives is not a boon to a good relationship (Miller, 1997). Probably the most effective solution involves working on enhancing relationship processes that naturally lead to decreased attention, such as focusing on positive aspects of one's partner (e.g., Fletcher & Simpson, 2000).

Sexual Attraction across the Menstrual Cycle

When Men are Especially Attracted to Fertile Women

Earlier I described research suggesting that women pay particular attention to attractive mates on menstrual cycle changes when they are most fertile. Indeed, the investigation of psychological changes that occur across the menstrual cycle represents one of the most exciting new developments in relationship psychology (Haselton & Gildersleeve, 2011). Research has documented an array of psychological and behavioral changes across the menstrual cycle, both in women and the men with whom they interact. Because such changes are inextricably linked with physiological and hormonal changes, identifying psychological changes across the menstrual cycle provides powerful and unique opportunities to examine the biological mechanisms underlying mating motives. Indeed, examining those mechanisms provides some of the best insight into the evolved

underpinnings of human mating.

Because fertility is essential for reproduction, evolutionary theories suggest that men and women possess psychological adaptations designed to activate mating motives during the period surrounding ovulation (Gangestad et al., 2005). Indeed, in many sexually reproducing species, fluctuations in female fertility play a key role in shaping sexual attraction and mating behavior (Kendrick & Dixson, 1983; Ziegler et al., 2005).

Most of the relevant research in humans has tended to focus on menstrual cycle shifts that occur within women. During the few days when conception risk is highest, for example, women report increases in sexual self-stimulation, sexual desire, and number of sexual fantasies (Bullivant et al., 2004; Harvey, 1987; Regan, 1996). Women also report greater interest in activities associated with finding and attracting new romantic partners, such as attending social gatherings (Haselton & Gangestad, 2006) and wearing more sexually provocative clothing (Durante, Li, & Haselton, 2008; Haselton, Mortezaie, Pillsworth, Bleske, & Frederick, 2007; Hill & Durante, 2009). During peak fertility, women show a particular preference for men displaying indicators of good genes (e.g., Feinberg et al., 2006; Gangestad, Garver-Apgar, Simpson, & Cousins, 2007; Gangestad, Thornhill, Garver-Apgar, 2005; Little, Jones, & Burris, 2007; Penton-Voak et al., 1999). Mating with a genetically superior man around the time of ovulation increases the likelihood of bearing genetically fit offspring. Consequently, when approaching ovulation, women engage in activities designed to secure genetic benefits from potential mates, in turn, maximizing the reproductive fitness gains afforded by their high level of fertility. Thus, during their fertile window, women experience an increase in their level of mating motivation, particularly in response to sexually desirable men.

Just as fertility plays an important role in the mating psychology of women, it also plays an important role in the mating psychology of men. The males of many species spend an extraordinary amount of time, energy, and resources attempting to court potentially fertile females and humans are no exception. From an evolutionary perspective, men who devoted their resources and energy toward pursuing fertile women (as opposed to women low in fertility) would have gained a substantial reproductive advantage over other men. As a result, evolutionary theories suggest that men possess adaptations that lead them to identify and engage in sexual courtship with women who are at their peak level of fertility. Indeed, in numerous species, female fertility plays a primary role in heightening male mating behavior (Kavaliers, Choleris, & Colwell, 2001; Ziegler et al., 2005).

Human women, unlike the females of many of other species, do not exhibit highly overt physical indicators of fertility, such as the sexual swellings that appear on the hindquarters of other primate females. Consequently, for quite some time, scientists presumed that women's ovulation was concealed (Burley, 1979). However, an emerging body of evidence suggests otherwise.

One intriguing line of research suggests that olfactory cues of ovulation – the scent of women during their peak period of fertility – may play a key role in motivating mating behavior among men. A number of studies have begun to suggest that smelling the scent of an ovulating woman promotes in men psychological and physiological changes that reflect increases in mating motivation. The idea that olfaction serves as a mechanism by which men can detect women's level of fertility breaks with the colloquial wisdom that humans do not rely much on smell as an important communicator of social

information. However, it is consistent with mating research in other species. In many animals, chemosensory signaling serves as a principal medium by which female fertility shapes male mating behaviors (Pankevich, Baum, & Cherry, 2004; Ziegler et al., 2005).

In humans, a growing number of studies indicate that men prefer the odors of women close to ovulation and rate those odors as more pleasant-smelling than the odors of women at other points in their menstrual cycle (Havlíček, Dvořáková, Bartoš, & Flegr, 2006; Singh & Bronstad, 2001; Thornhill et al., 2003; cf. Roney & Simmons, 2012). Those findings provide evidence that, in humans, men are sensitive to subtle signs of female fertility. Moreover, they suggest that olfaction may be a key modality through which men are able to detect whether a woman is ovulating.

That notion that the scent of fertility elicits mating motivation in men is also confirmed by physiological data. In two experiments, Miller and Maner (2010a) asked male participants to smell t-shirts, some of which had been worn by women during the fertile phase of their cycle. After smelling the t-shirts, the men provided saliva samples, which were subsequently assayed for testosterone—a hormone associated with sexual desire and mating behavior. Findings from both experiments showed that men who had smelled the t-shirt of an ovulating woman (as compared to control shirts) displayed higher testosterone levels. Thus, the findings suggest that the scent of fertility led to specific physiological changes in men known to promote sexual desire and sexual courtship (cf. Roney & Simmons, 2012).

Other recent research has explored whether the scent of female fertility produces broader changes in men's mating-related psychology and behavior. In one experiment, Miller and Maner (2011) asked men to smell the scent of an ovulating woman, a non-

ovulating woman, or a control scent and then to perform a task designed to measure the accessibility of sexual concepts. Men performed a word stem completion task in which some of the word stems could be completed to make sexual words (e.g., S _ X and _ U S T). Findings from the experiment showed that men who smelled the t-shirts imbued with the scent of ovulation generated more sexual words than did men in the other two conditions. The increased accessibility of sexual thoughts and concepts is consistent with the idea that subtle cues to fertility activate a mating mindset in men.

In another study (Miller & Maner, 2011), men smelled t-shirts worn by women (some of whom were ovulating and some of whom were not) and then were asked to rate the emotions the woman was feeling when she was wearing the shirt. We had participants perform this task because previous work had shown that, when men are motivated to find a sexual partner, they sometimes perceive women as being more sexually aroused than they really are (Maner et al., 2005; see also Haselton & Buss, 2000). Thus, if the scent of fertility primes mating motives in men, then those men exposed to the scent of a fertile woman should think that the woman is highly sexually aroused. Indeed, men who smelled the scent of ovulation (as compared with a control scent) thought that the t-shirt wearer felt more sexually aroused. This was particularly true for men scoring high on a measure of chemical sensitivity to smells. Moreover, although men also rated the extent to which the t-shirt wearer was feeling happy, sad, and afraid, there were no effects of female fertility on ratings of those emotions. Thus, the scent of fertility produced a highly specific cognitive bias known to reflect the presence of heightened male mating motivation.

A number of additional studies have taken this line of research even further to examine the implications for men's behavior. For example, Gangestad, Thornhill, and Garver (2002) and Haselton and Gangestad (2006) found that women report heightened mate-guarding behaviors (e.g., possessiveness and monopolization of the women's time) by their male romantic partners during periods of peak fertility (see also Burriss & Little, 2006). This makes sense from the standpoint that men should be especially inclined to guard against potential infidelity when their partner is highly fertile, in order to avoid potential cuckoldry. Additionally, Miller et al. (2007) reported that men tend to give larger tips to female dancers when the dancers are near ovulation as compared to other phases of their cycle.

In another study (Miller & Maner, 2011), male participants interacted closely with a female confederate at various times during her menstrual cycle. Two aspects of men's behavior were assessed. First, the interaction was videotaped and we assessed the degree to which men mimicked the posture of the confederate. Because behavioral mimicry can signal romantic attraction (Van Straaten et al., 2008), we reasoned that men might mimic the confederate's behavior more when she was close to ovulation, as compared to when she was far from ovulation. Indeed, findings demonstrated that this was the case.

The second aspect of men's behavior involved risk-taking. Toward the end of the interaction men performed a blackjack task while the confederate watched. Research indicates that when men are motivated to attract a mate they often behave in risky ways as a way of signaling their confidence and ambition (Daly & Wilson, 2001; Baker & Maner, 2008, 2009). Consistent with this ideas, men made riskier choice on the blackjack task (i.e., they decided to hit more) when the confederate was ovulating, as compared to

when she was low in fertility. These findings suggest that signs of female fertility prompt increases in behaviors that reflect heightened male mating motivation.

Notably, in the course of this study, the confederate's behavior was carefully scripted: she kept eye contact and conversation to a minimum; she wore similar clothes and make-up across sessions; she behaved in an introverted way and was not flirtatious. Independent observers confirmed each of these aspects of her behavior. Nevertheless, despite the fact that nothing in her overt behavior signaled her level of fertility, men responded with behaviors designed to increase romantic attraction. Her level of fertility was presumably communicated via more subtle cues such as scent and vocal tone (Bryant & Haselton, 2009). These findings speak to the powerful effects relatively covert signs of fertility have on men's behavior.

When Men are Less Attracted to Fertile Women

Here we discuss one intriguing exception to the literature on attraction and fertility. Just as individuals who are already in a committed relationship often avoid attending to desirable relationship alternatives, so too might they avoid responding with attraction to highly fertile women. In the study described above (Miller & Maner, 2011), men responded to a fertile research confederate with signs of enhanced romantic attraction – they took more risks and mimicked the confederate's nonverbal behavior. There was one dependent variable, however, that produced a more complex pattern of findings: overt self-reported judgments of attractiveness (Miller & Maner, 2010b). At the end of the session, men reported on how attractive they thought the confederate was using a standard Likert scale. Based on the fertility literature, one might expect that men

would rate the confederate as more attractive when she was highly fertile than when she was not. And, indeed, this is exactly what we found, but only for single men. Men who were already in a committed romantic relationship rated the confederate as significantly *less* attractive – not more attractive – when she was ovulating. This pattern is consistent with a desire to protect their level of relationship commitment in the face of a highly desirable romantic alternative to their current partner. That is, men presumably found the woman to be especially attractive when she was highly fertile and, consequently, were especially motivated to regulate their level of desire so as to avoid any loss of commitment.

It is interesting to note that evidence for relationship protective responses was found for the overt self-report measure of perceived attractiveness but not for the other, more implicit behavioral measures. One possible explanation is that men interpreted the overt measure as revealing their level of romantic desire and so they became especially motivated to downregulate that desire. This sort of response would be consistent with other evidence (mentioned earlier) for the devaluation of romantic alternatives (e.g., Lydon et al., 2011). In contrast, men may not have interpreted the other behavioral measures (nonverbal mimicry, risk-taking) as indicative of mating behavior and, in those circumstances, the motivation to maintain their relationship was not activated.

The study by Miller and Maner (2010b) suggests that motivated forms of relationship maintenance are calibrated not only to highly overt characteristics in alternative relationship partners such as physical attractiveness; they are also calibrated to highly subtle yet reproductively important cues such as level of fertility. Those findings

therefore reveal a heretofore hidden aspect of the regulatory processes through which people might avoid temptation and protect their long-term romantic relationships.

Two Unresolved but Interesting Issues

In closing, I briefly raise two additional questions spawned by the recent literature on adaptive relationship cognition: 1) Does relationship maintenance require conscious executive control? 2) To what extent are their sex differences in mating-related psychological processes?

With regard to executive control, work from our lab suggests the operation of relationship maintenance processes in the absence of conscious executive control. For example, the dependent measure we use in our work on attention biases assesses attentional processes that are relatively quick and automatic (e.g., Maner et al., 2007). People in relationship avert their attention from sources of temptation apparently without much time or need for conscious control. Other work, however, suggests that executive control plays an important role in helping people avoid the temptation of attractive alternatives. For example, in a line of research by Karremans and colleagues, people high in trait self-control (Pronk, Karremans, & Wigboldus, 2011) and state self-control (Ritter, Karremans, & Van Schie, 2010) were better able than those low in self-control to resist temptations posed by attractive relationship alternatives. It seems likely that automatic and consciously controlled processes both play a role in helping people avoid temptation. Future research would benefit from assessing more carefully the ways in which particular

aspects of relationship maintenance involve automatic versus consciously regulated processes.

With regard to sex differences, a large literature in evolutionary psychology suggests sex differences in the way men's and women's mating strategies, their desire for casual sexual relationships, and other mating-related variables (e.g., Buss & Schmitt, 1993; Clark & Hatfield, 1989; Simpson & Gangestad, 1991). Yet, other work suggests that both men and women pursue casual sex relationships, engage in infidelity, and the like (Haselton & Gangestad, 2006; Lammers et al., 2011). One possible reconciliation is suggested by our work on mating-related cognition. For example, in our work on attention to highly attractive members of the opposite sex, we sometimes find sex differences in baseline levels of attention to attractive targets, with men attending to attractive targets more than women (e.g., Maner et al., 2003). However, we rarely find that a person's sex moderates effects of motivational priming on attention to attractive mates; in response to priming, women are just as interested in attractive men as men are in attractive women (e.g., Maner et al., 2007). This pattern fits with a model in which men and women do differ in their pre-potent levels of desire for casual sex, preference for attractiveness, and so on; but once mating motives are active, men and women display similar patterns of mating-related cognition and behavior.

Closing

Mating is a powerful motivator and it has profound effects on all levels of perception, cognition, and behavior. Mating motives lead people to rigorously seek novel

mating opportunities, while relationship maintenance motivates lead people to protect the relationships they already have. These motives shape the way people attend to, evaluate, and behave toward many types of social stimuli. Integrating theories of social psychology and evolutionary psychology has provided a strong overarching framework with which to understand the adaptively motivated aspects of people's relationship psychology. The research described in this chapter has implications for understanding a broad range of relationship phenomena, from romantic attraction to the dissolution of a long-term romantic partnership. More broadly, it illustrates the sometimes complex interplay between motivation and its regulation.

Footnote

1. Throughout the chapter, I focus on heterosexual relationships. Many of the basic theories described here apply also to gay, lesbian, and bisexual relationships, although some of the specific predictions and findings do depend on a person's sexual preference.

References

- Amoto P. R., & Rogers, S. J. (1997). A longitudinal study of marital problems and subsequent divorce. *Journal of Marriage and Family*, *59*, 612-624.
- Anderson, U. S., Perea, E. F., Becker, D. V., Ackerman, J. M., Shapiro, J. R., Neuberg, S. L., Kenrick, D. T. (2010). I only have eyes for you: Ovulation redirects attention (but not memory) to attractive men. *Journal of Experimental Social Psychology*, *46*, 804-808.
- Baker, M. D., & Maner, J. K. (2009). Male risk-taking as a context-sensitive signaling device. *Journal of Experimental Social Psychology*, *45*, 1136-1139.
- Baker M. D., & Maner, J. K. (2008). Risk-taking as a situationally sensitive male mating strategy. *Evolution and Human Behavior*, *29*, 391-395.
- Brehm, J. W. (1966.) *A theory of psychological reactance*. Oxford, England: Academic Press.
- Bryant, G. A., & Haselton, M. G. (2009). Vocal cues of ovulation in human females. *Biology Letters*, *5*, 12-15.
- Bullivant, S. B., Sellergren, S. A., Stern, K., Spencer, N. A., Jacob, S., Mennella, J. A., & McClintock, M. K. (2004). Women's sexual experience during the menstrual cycle: Identification of the sexual phase by noninvasive measurement of luteinizing hormone. *Journal of Sex Research*, *41*, 82-93.
- Burley, N. (1979). Evolution of concealed ovulation. *American Naturalist*, *114*, 835-858.
- Burriss, & Little, (2006). Effects of partner conception risk phase on male perception of dominance in faces. *Evolution and Human Behavior*, *27*, 297-305.
- Buss, D. M. (1989). Sex differences in human mate preferences: Evolutionary hypotheses

- tested in 37 cultures. *Behavioral and Brain Sciences*, 12, 1-49.
- Buss, D. M., & Schmitt, D. P. (1993). Sexual strategies theory: An evolutionary perspective on human mating. *Psychological Review*, 100, 204-232.
- Murray, S. L., Holmes, J. G., & Collins, N. L. (2006). Optimizing assurance. The risk regulation system in relationships. *Psychological Bulletin*, 132, 641-666.
- Cunningham, M. R., Barbee, A. P., & Pike, C. L. (1990). What do women want? Facialmetric assessment of multiple motives in the perception of male facial physical attractiveness. *Journal of Personality and Social Psychology*, 59, 61-72.
- Daly, M. & Wilson, M. (2001). Risk-taking, intrasexual competition, and homicide. *Nebraska Symposium on Motivation*, 47, 1-36.
- DeWall, N., Maner, J. K., Deckman, T., & Rouby, D. A. (2011). Forbidden fruit: Inattention to attractive alternatives provokes implicit relationship reactance. *Journal of Personality and Social Psychology*, 100, 621-629.
- Diamond, L. M. (2004). Emerging perspectives on the distinctions between romantic love and sexual desire. *Current Directions in Psychological Science*, 13, 116-119.
- Diamond, L. M., & Dickenson, J. (2012). The neuroimaging of love and desire: Review and future directions. *Clinical Neuropsychiatry*, 9, 39-46.
- Durante, K. M., Li, N. P., Haselton, M. G. (2008). Changes in women's choice of dress across the ovulatory cycle: Naturalistic and laboratory task-based evidence. *Personality and Social Psychology Bulletin*, 34, 1451-1460.
- Fisher, R. A. (1958). *The genetical theory of natural selection* (2nd ed.) Dover, New York.
- Fletcher, G. J. O. & Simpson, J. A. (2000). Ideal standards in close relationships: Their structure and functions. *Current Directions in Psychological Science*, 9, 102-105.

- Frank, R. H. (1988). *Passions within reason: The strategic role of the emotions*. New York: Norton.
- 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.
- Gangestad, S. W. & Thornhill, R. (1997). The evolutionary psychology of extrapair sex: The role of fluctuating asymmetry. *Evolution and Human Behavior, 18*, 69-88.
- Gangestad, S. W., Thornhill, R., & Garver-Apgar, C. E. (2005). Adaptations to ovulation: Implications for sexual and social behavior. *Current Directions in Psychological Science, 14*, 312-316.
- Gonzaga, G. C., Keltner, D., Londahl, E. A., & Smith, M. D. (2001). Love and the commitment problem in romantic relations and friendships. *Journal of Personality and Social Psychology, 2*, 247 – 262.
- Harvey, S. M. (1987). Female sexual behaviour: Fluctuations during the menstrual cycle. *Journal of Psychosomatic Research, 31*, 101-110.
- Haselton, M., & Buss, D. (2000). Error management theory: A new perspective on biases in cross-sex mind reading. *Journal of Personality and Social Psychology, 78*, 81-91.
- Haselton, M. G., & Gangestad, S. W. (2006). Conditional expression of women's desires and men's mate-guarding across the ovulatory cycle. *Hormones and Behavior, 49*, 509-518.
- Haselton, M. G. & Gildersleeve, K. (2011). Can men detect ovulation? *Current Directions in Psychological Science, 20*, 87-92

- Haselton, M. G., Mortezaie, M., Pillsworth, E. G., Bleske-Rechek, A., & Frederick, D. A. (2007). Ovulatory shifts in human female ornamentation: Near ovulation, women dress to impress. *Hormones and Behavior*, *51*, 40-45.
- Havlíček, J., Dvořáková, R., Bartoš, L., & Flegr, J. (2006). Non-advertised does not mean concealed: Body odour changes across the human menstrual cycle. *Ethology*, *112*, 81-90.
- Hill, S. E., & Durante, K. M. (2009). Do women feel worse to look their best? Testing the relationship between self-esteem and fertility status across the menstrual cycle. *Personality and Social Psychology Bulletin*, *35*, 1592-1601.
- Johnson, D. J., & Rusbult, C. E. (1989). Resisting temptation: Devaluation of alternative partners as a means of maintaining commitment in close relationships. *Journal of Personality and Social Psychology*, *56*, 967-980.
- Kaveliers, M., Choleris, E., & Colwell, D. D. (2001). Brief exposure to female odors “emboldens” male mice by reducing predator-induced behavioral and hormonal responses. *Hormones and Behavior*, *40*, 497-509.
- Kendrick, K. M., & Dixson, A. F. (1983). The effect of the ovarian cycle on the sexual behavior of the common marmoset (*Callithrix jacchus*). *Physiology and Behavior*, *30*, 735-742.
- Kenrick, D. T., & Keefe, R. C. (1992). Age preferences in mates reflect sex differences in reproductive strategies. *Behavioral and Brain Sciences*, *15*, 75-133.
- Kenrick, D. T., Neuberg, S. L., Zierk, K. L., & Krones, J. M. (1994). Evolution and social cognition: Contrast effects as a function of sex, dominance, and physical attractiveness. *Personality and Social Psychology Bulletin*, *20*, 210-217.

- Laeng, B., & Falkenberg, L. (2007). Women's pupillary responses to sexually significant others during the hormonal cycle. *Hormones and Behavior*, *52*, 520-530.
- Lammers, J., Stoker, J. I., Jordan, J., Pollmann, M., & Stapel, D. A. (2011). Power increases infidelity among men and women. *Psychological Science*, *22*, 1191–1197.
- Lydon, J. E., Meana, M., Sepinwall, D., Richards, N., & Mayman, A. (1999). The commitment calibration hypothesis: When do people devalue attractive alternatives? *Personality and Social Psychology Bulletin*, *25*, 152-161.
- 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.
- Maner, J. K., Gailliot, M. T., & Miller, S. L. (2009). The implicit cognition of relationship maintenance: Inattention to attractive alternatives. *Journal of Experimental Social Psychology*, *97*, 74-87.
- Maner, J. K., Gailliot, M. T., Rouby, D. A., & Miller, S. L. (2007). Can't take my eyes off you: Attentional adhesion to mates and rivals. *Journal of Personality and Social Psychology*, *93*, 389-401.
- Maner, J. K., Kenrick, D. T., Becker, D. V., Delton, A. W., Hofer, B., Wilbur, C., & Neuberg, S. (2003). Sexually selective cognition: Beauty captures the mind of the beholder. *Journal of Personality and Social Psychology*, *85*, 1107-1120.
- Maner, J. K., Kenrick, D. T., Neuberg, S. L., Becker, D. V., Robertson, T., Hofer, B., Delton, A., Butner, J., & Schaller, M. (2005). Functional projection: How fundamental social motives can bias interpersonal perception. *Journal of*

- Personality and Social Psychology*, 88, 63-78.
- Maner, J. K., Rouby, D. A., & Gonzaga, G. (2008). Automatic inattention to attractive alternatives: The evolved psychology of relationship maintenance. *Evolution and Human Behavior*, 29, 343-349.
- Miller, G., Tybur, J. M., & Jordan, B. D. (2007). Ovulatory cycle effects on tip earnings by lap dancers: Economic evidence for human estrus. *Evolution and Human Behavior*, 28, 375-381.
- Miller, R. S. (1997). Inattentive and contented: Relationship commitment and attention to alternatives. *Journal of Personality and Social Psychology*, 73, 758-766.
- Miller, S. L., & Maner, J. K. (2010). Scent of a woman: Men's testosterone responses to olfactory ovulation cues. *Psychological Science*, 21, 276-283.
- Pankevich, D. E., Baum, M. J., & Cherry, J. A. Olfactory sex discrimination persists, whereas the preference for urinary odorants from estrous females disappears in male mice after vomeronasal organ removal. *Journal of Neuroscience*, 24, 9451-9457.
- Penton-Voak, I. S., Perrett, D. I., Castles, D. L., Kobayashi, T., Burt, D. M., Murray, L. K., & Minamisawa, R. (1999). Menstrual cycle alters face preferences. *Nature*, 399, 741-742.
- Plant, E. A., Kunstman, J. W., & Maner, J. K. (2010). You do not only hurt the one you love: Self-protective responses to attractive relationship alternatives. *Journal of Experimental Social Psychology*, 46, 474-477.

- Pronk, T., Karremans, J. C., & Wigboldus, D. (2011). How can you resist? Executive control helps romantically involved individuals to stay faithful. *Journal of Personality and Social Psychology, 100*, 827-837.
- Regan, P. C. (1996). Rhythms of desire: The association between menstrual cycle phases and female sexual desire. *The Canadian Journal of Human Sexuality, 5*, 145-156.
- Ritter, S., Karremans, J. C., & Van Schie, H. (2010). The role of self-regulation in derogating attractive alternatives. *Journal of Experimental Social Psychology, 46*, 631-637.
- Roney, J. R., & Simmons, Z. L. (2012). Men smelling women: Null effects of exposure to ovulatory sweat on men's testosterone. *Evolutionary Psychology, 10*, 703-713.
- Sadalla, E. K., Kenrick, D. T., & Vershure, B. (1987). Dominance and heterosexual attraction. *Journal of Personality & Social Psychology, 52*, 730-738.
- Scheib, J. E., Gangestad, S. W. & Thornhill, R. (1999). Facial attractiveness, symmetry, and cues of good genes. *Proceedings of the Royal Society of London, B, 266*, 1913-1917.
- Simpson, J. A., Gangestad, S. W., & Lerma, M. (1990). Perception of physical attractiveness: Mechanisms involved in the maintenance of romantic relationships. *Journal of Personality and Social Psychology, 59*, 1192-1201.
- Simpson, J. A., & Gangestad, S. W. (1991). Individual differences in sociosexuality: Evidence for convergent and discriminant validity. *Journal of Personality and Social Psychology, 60*, 870-883.
- Singh, D. (1993). Adaptive significance of female physical attractiveness: Role of waist-to-hip ratio. *Journal of Personality and Social Psychology, 65*, 293-307.

- Singh, D., & Bronstad, P. M. (2001). Female body odour is a potential cue to ovulation. *Proceedings of the Royal Society of London, B*, 268, 797–801.
- Thornhill, R., Gangestad, S. W., Miller, R., Scheyd, G., McCollough, J. K., & Franklin, M. (2003). Major histocompatibility complex genes, symmetry, and body scent attractiveness in men and women. *Behavioral Ecology*, 14, 668-678.
- Tutin, C. E. G. (1979). Mating patterns and reproductive strategies in a community of wild chimpanzees (*Pan troglodytes*). *Behavioral Ecology and Sociobiology*, 6, 29-38.
- van Straaten, I., Engels, R., Finkenauer, C., & Holland, R. W. (2008). Sex differences in short-term mate preferences and behavioral mimicry: A semi-naturalistic experiment. *Archives of Sexual Behavior*, 37, 902–911.
- Wilcox, A. J., Weinberg, C. R., & Baird, D. D. (1995). Timing of sexual intercourse in relation to ovulation: Effects on the probability of conception, survival of the pregnancy and sex of the baby. *New England Journal of Medicine*, 333, 1517-1521.
- Ziegler, T. E., Schultz-Darken, N. J., Scott, Jillian, J., Snowdon, C. T., & Ferris, Craig, F. (2005). Neuroendocrine response to female ovulatory odors depends upon social condition in male common marmosets, *Callithrix jacchus*. *Hormones and Behavior*, 47, 56-64.