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Sexually selective cognition

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From an evolutionary perspective, no set of challenges is as central to human life as those involved in mating. In facing these challenges, people recruit an array of adaptive psychological processes designed to help them identify desirable mates, assess whether potential mates are romantically accessible, and avoid potential threats to the maintenance of long-term relationships. Here we review recent evidence for mating-related cognitive attunements and biases including preferential processing of desirable features in members of the opposite sex, selective attention to signs of physical attractiveness, the over-perception of sexual interest from potential partners, perceptual neglect of attractive alternatives to one's long-term partner, and perceptual vigilance to same-sex romantic rivals.

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The human mind is exquisitely adapted to solve a diverse range of social problems. From the perspective of evolutionary biology, no set of problems is as central to human existence as those involved in mating. The engine that drives biological evolution is differential reproductive success — some members of a species are better able than other members to reproduce viable copies of their genes. And the sine qua non of reproductive success is success in mating. As a result, humans, like members of other sexually reproducing species, are powerfully motivated to seek out and attract desirable mating partners. A number of theories detail how and when these motivations are expressed (see [Table 1](#)). These theories offer important implications for understanding the role of specific evolutionary pressures on cognitive functioning, from early-in-the-stream processes such as visual attention to more downstream processes such as social judgments and interpretations of sexual stimuli [[1](#),[2](#)].

Theories of sexual selection [[3](#)] suggest that members of both sexes are attracted to characteristics in the opposite sex likely to confer high levels of reproductive success to the perceiver. For example, both men and women tend to prefer physically attractive features, because those features can signal high levels of fertility (in women) and high genetic quality (in both sexes) [[4](#)]. Consequently, many cognitive processes are particularly attuned to the presence of physical attractiveness in other people.

Some of the traits people prioritize in potential mates differ between men and women. Theories of differential parental investment [[5](#)] imply that, because men and women have different levels of initial obligatory parental investment, they tend to prioritize somewhat different traits, especially in long-term partners. Men (the lower-investing sex) tend to prioritize signs of physical attractiveness, which can reflect high levels of fecundity. In contrast, women (the higher-investing sex) tend to prioritize a man's social status and ability to invest resources in his mate and her offspring [[6,7](#)]. As a result of these sex differences, men and women sometimes display different mating-related cognitive attunements and biases.

Error Management Theory [[8](#)] suggests that mating-related cognition is biased in ways designed to avoid costly reproductive errors, even if it means committing less costly errors. Consequently, cognitive processes are designed to navigate tradeoffs in a way that ultimately maximizes reproductive outcomes.

Here, we review recent, cutting-edge developments in the cognitive science of human mating. We describe evidence for specialized cognitive mechanisms that facilitate several key mating goals: identification of potential mates, identification of romantic desire in potential mates, and avoidance of relationship threats (see [Figure 1](#)).

Goal: identifying potential mates

To succeed in mating, people devote tremendous energy toward seeking out and identifying desirable partners. That energy is reflected in people's visual attention to characteristics that determine a potential mate's reproductive value. Several lines of research suggest that people selectively and automatically attend to members of the opposite sex who display phenotypic cues signaling their reproductive value [[9](#)].

Because physical attractiveness is highly valued in both men and women, and because it is an easily and rapidly recognizable stimulus characteristic, both men and

Table 1

Key evolutionary theories suggest ways in which social cognition is adaptively tuned.

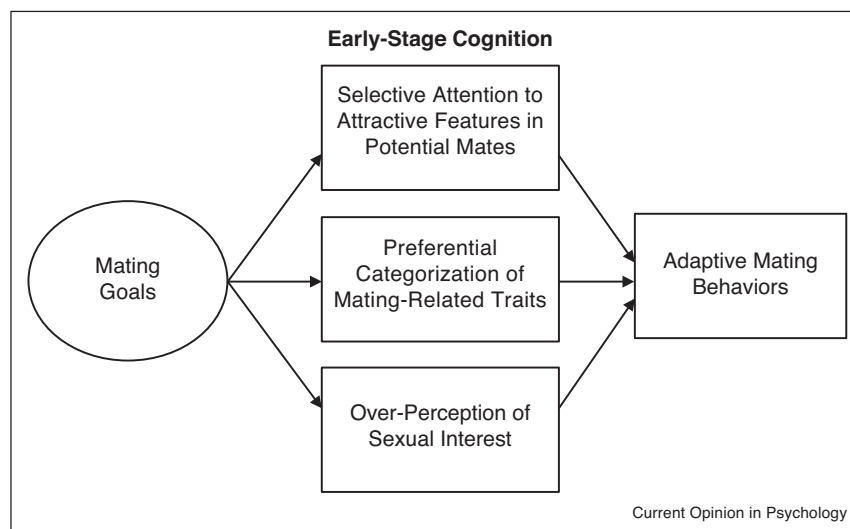
Underlying theoretical bases of mating-related cognition			
Theory	Description	Cognitive implications	Empirical examples
Sexual selection [3]	Competition among members of a sex to achieve access to, express desirability toward, and be chosen by the opposite sex	People are highly attuned to traits in the opposite sex that signal high reproductive value; people are also highly motivated to display those same traits when they possess them	People are highly attentive to signs of physical attractiveness in the opposite sex People are highly vigilant to same sex romantic rivals
Parental investment [5,7,46]	Sex differences in levels of minimum obligatory parental investment in offspring lead women to be sexually choosy and to prioritize status in potential mates, and men to be less choosy and to prioritize signs of attractiveness	Men and women preferentially process features in the opposite sex that convey high genetic fitness Women are relatively more inclined to process features that convey reproductively beneficial qualities in the context of long-term relationships	Both sexes attend selectively to signs of physical attractiveness in potential short-term mates Unlike men, women are highly attentive to signs of high social status in potential partners
Error management [8,47]	In the presence of adaptive tradeoffs, the mind is designed to avoid committing the costliest of adaptive errors, even at the risk of committing less costly errors	When cost asymmetries exist between two possible errors (e.g. overperceiving sexual accessibility vs. missing out on a sexual encounter), people display cognitive biases that lead them to avoid the reproductively costlier error	Men tend to over-perceive the level of sexual desire expressed by women and to perceive them as more accessible than they may really be Women tend to under-perceive the romantic commitment intent expressed by men

women with active mating motives selectively attend to highly attractive members of the opposite sex. This is true both when people are experimentally primed with sexual desire [10] and, for women, when they are ovulating [11]. Ovulation reflects the period of peak fertility, and is associated with heightened attraction to signs of high genetic quality in men [12]. Thus, it makes sense that around ovulation women would attend carefully to attractive traits in men that signal good genes — traits that

might be passed on to the woman's offspring were she to conceive a child.

Analysis of neural activity also supports the early-stage processing of physical attractiveness in potential mates. Data using event-related potentials (ERPs) indicates heightened early-stage ERPs when men attend to highly attractive women, suggesting the operation of automatic and motivated attentional biases [13]. Such findings are

Figure 1



Mating goals affect behavior through the engagement of sexually selective cognitive processes.

consistent with other recent ERP research: in a recognition memory study, attractive female faces (as compared with less attractive female faces) elicited greater prefrontal brain activity, which may reflect the reward value of attractiveness for males [14]. The extent to which men devote resources to processing attractive women also depends on the man's own mate value. ERP data suggest that, although most men devote resources to processing images of highly attractive women, only men with relatively low mate value carefully process less women, presumably because those women reflect realistic mates for relatively less attractive men [15^{*}]. Ironically, because cognitive resources are limited, focusing on attractive women and even just anticipating a cross-sex interaction impairs men's cognitive performance [16,17].

Recent research has extended such findings by delineating the portions of the body that are preferentially attended to when people are evaluating potential mates. For example, the dynamic movements of dancers help to display the head, neck, and trunk, and women attend relatively more to these displays when they are exhibited by attractive (skilled) male dancers [18]. Eye-tracking research using static nude male and female targets further suggests that both men and women attend selectively to regions of the body around the chest and pelvis [19]. Moreover, studies have differentiated short-term from long-term mating motives, and determined that short-term motives cause men to attend preferentially to the waist and hips (rather than the face) on female targets [20]. The waist and hips, and more specifically the ratio of the circumference of the waist to the hips, can signal a woman's level of fertility [21], so these attention findings are consistent with the idea that short-term mating motives lead men to attend carefully to signs of a woman's immediate reproductive value.

We have focused above on the preferential processing of physical attractiveness, but this is not the only type of cue that stands out early in the cognitive stream. For instance, around the time of ovulation, women increase their attention to male status displays ([22]; cf. [23]), consistent with the notion that mating with a high status man can confer benefits to a woman's offspring via the investment of resources. Further, attention is not the only mate identification mechanism influenced by romantic motivations. Near ovulation, women are also more accurate at judging male sexual orientation [24], suggesting that mating motives increase women's sensitivity to cues signaling whether or not men reflect realistic mating partners. Indeed, women's accuracy at judging male sexual orientation also increases when mating motives have been experimentally primed [24]. Categorization processes are also important with respect to physical attractiveness: both men and women primed with mating motives increased the extent to which they categorized members of the opposite sex as a function of how

physically attractive they were [25^{**}]. Such findings point to the various ways in which early-stage cognition is adapted to the goal of identifying potential mates.

Goal: identifying which potential mates are romantically accessible

A second goal that plays a key role in achieving romantic success is determining whether a potential mate is romantically accessible. Thus, another major thrust of recent research pertains to perceptions of sexual desire. Sometimes, those perceptions are relatively accurate [26], as when women use men's displays of status-based goods to index those men's level of short-term romantic interest [27]. However, perceptions of sexual desire are often colored by bias. Haselton and Buss proposed that two perceptual biases involving desire stem from the logic of error management theory: a sexual-overperception bias by men (estimating more sexual desire in women than actually exists) and a commitment-skepticism bias by women (estimating less long-term romantic commitment than actually exists). These biases were hypothesized to help minimize costly mating-related errors such as those proposed by parental investment theory. A number of early studies supported this reasoning [8,28].

Recent research has extended these findings in important ways. For example, Choi and Hur demonstrated that men's heightened perceptions of women's sexual desire are associated with effective courtship behaviors, confirming an important assumption of the error management model, and suggesting that men's sexual perceptions may be reproductively functional [29^{*}]. Whereas initial studies mainly investigated sexual perception by asking participants to judge sexual interest in other people based on videotaped interactions or mere photographs, more recent research has extended this to methods involving close face-to-face interactions. Biases in sexual perception have now been replicated using a 10-min face-to-face interaction paradigm [30^{*}] and speed-dating methods [31^{**}].

Other research has examined factors that moderate biases in sexual perception. Howell and colleagues demonstrated biases in sexual overperception among both men and women with an unrestricted sociosexual orientation — those willing to engage in sexual contact without requiring high levels of commitment [32]. Research has also examined situational moderators. For example, Kunstman and Maner showed that men and women who held powerful roles tended to overestimate sexual interest communicated by the opposite sex, consistent with evolutionary evidence that those atop the social hierarchy tend to enjoy greater access to potential mates [33]. Finally, men who were exposed to the scent of female ovulation overestimated women's level of sexual interest, consistent with the idea that ovulation can spark male mating motives [34]. In sum, biases in sexual perception

may further the goal of identifying which potential mates are romantically accessible.

Goal: avoiding relationship threats

Of course, forming a relationship is often just the start — many people are committed to maintaining their relationship over the long-term. One key long-term goal involves avoiding temptations posed by desirable alternatives to one's current partner [35]. Early-stage cognitive processes can help manage this challenge. Indeed, recent evidence suggests that people who are committed to a long-term relationship sometimes have their attention repelled, rather than captured, by images of attractive people who might otherwise be seen as desirable mates ([36,37], see also [38]). Such effects are not limited to attention: romantically attached people (compared with unattached people) remember attractive alternatives as being less attractive ([39]; see also [40]).

Unfortunately, perceptual neglect of attractive relationship alternatives does not always protect one's relationship. One set of studies suggests that, when people's attention is artificially constrained so that they are unable to attend to attractive alternatives (as opposed to freely choosing to attend away), people display reactance, such that they remember relationship alternatives better and display more, not less, interest in infidelity [41].

Another relationship threat involves romantic rivals who might try to encroach on one's long-term relationship. Evidence suggests that, when people are motivated to ward off romantic rivals, they preferentially attend to, remember, and negatively evaluate attractive members of their own sex [42]. Moreover, when primed with a mating motive, men (but not women) act aggressively toward perceived rivals (see also [43,44**]). This is consistent with both theories of sexual selection and differential parental investment, which suggest high levels of intra-sexual competition among men [45].

Summary: recent developments in the cognition of human mating

Research on the cognition of human mating has proliferated in recent years. Building on prior studies suggesting that the activation of mating motives leads to adaptive attunements and biases in the way people process reproductively relevant stimuli, recent studies provide a fine-grained portrait of when and why people preferentially process particular features in members of the opposite sex. These selective, early-stage mechanisms help to fulfill important mating-related goals. Important objectives for future study include further delineating the physiological processes that underlie patterns of mating-related cognition, as well as situational factors that serve as catalysts for those processes. In addition, because most previous studies, including those described in this article, have been aimed at understanding heterosexual

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