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Notes

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2. This review focuses on emotion regulation in adults. For a recent review of emotion regulation in childhood, see Eisenberg, Fabes, Guthrie, and Reiser (2000).

3. The term "reappraisal" has a long history. Although some researchers find it confusing because it suggests that there is an initial appraisal that is then reworked, I use it for historical continuity. My focus here is on reappraisal that is used to cognitively transform a potentially negative-emotion-inducing situation so as to reduce its emotional impact. The term "suppres-

sion" also has a long history. It has been used to refer to inhibiting feelings, behavior, or thoughts. Here I use it to refer to inhibiting emotion-expressive behavior.

4. One puzzle is why reappraisal did not decrease physiological responding in this study. The potency and brevity of the surgical film may have made it difficult for participants to curtail their physiological responses in the time specified.

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Cognitive Biases and Emotional Wisdom in the Evolution of Conflict Between the Sexes

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Abstract

Two recent theories within evolutionary psychology have produced novel insights into conflict between the sexes. According to *error management theory* (EMT), asymmetries over evolutionary time in the cost-benefit consequences of specific social inferences have produced predictable cognitive biases. Women, for example, appear to underinfer commitment in response to signals of

resource display. Men often overinfer a woman's sexual desire when she merely smiles at or casually touches them. These inferential biases, according to EMT, represent functional adaptations rather than markers of irrationality in information processing. According to *strategic interference theory*, certain "negative emotions" function to motivate action to reduce conflict produced by impediments to preferred social strat-

egies. Emotions such as jealousy and anger, rather than reducing rationality, may embody inherited ancestral wisdom functional in dealing with interference inflicted by other individuals. These evolution-based theories have produced novel empirical discoveries and challenge traditional theories anchored in the premise that cognitive biases and negative emotions necessarily lead to irrationality.

Keywords

conflict; cognitive bias; negative emotions; sex differences; sexuality; evolutionary psychology

In mating and sexuality more than in any other domain, women and men have confronted different

adaptive challenges over the long course of human evolutionary history. Women have been required to make a 9-month investment to produce a child. Men have not. Because fertilization occurs within women, men have faced the problem of uncertainty that they are the genetic parents. Women have not. It would be astonishing if men and women had not evolved somewhat different mating strategies to grapple with their differing adaptive challenges (Buss & Schmitt, 1993). Predictions generated by evolutionary models about sex differences in mate preferences, sexual desires, and elicitors of romantic jealousy, for example, have all been robustly documented across a variety of cultures (Buss, 1999). What has been less well appreciated is how sex differences in mating strategies produce specific forms of sexual conflict when they are expressed in behavior (see Buss & Malamuth, 1996).

Recent evolutionary work has inspired subtle hypotheses about the ways in which women and men clash, ranging from the erroneous inferences they make about the other sex to the emotions they experience when preferred mating strategies are thwarted. This article highlights two of these evolutionarily inspired research programs, one dealing with cognitive biases and one dealing with emotions as tracking devices.

ERROR MANAGEMENT THEORY: ADAPTIVE COGNITIVE ERRORS AND CONFLICT BETWEEN THE SEXES

Humans live in an uncertain social world. We must make inferences about others' intentions and emotional states. How attracted is he to her? How committed is she to him? Was that bump in the hallway an accident, or does it reveal

hostile intentions? Some deeds, such as sexual infidelity and murder, are intentionally concealed, rendering uncertainty greater and inferences more tortuous. We are forced to make inferences about intentions and concealed deeds using a chaos of cues that are only probabilistically related to the deeds' occurrence. An unexplained scent on one's romantic partner, for example, could signal an extramarital affair or innocuous olfactory acquisition from a casual conversation.

Just as there are two types of correct inferences (true positives, true negatives), there are two types of inferential errors. One can falsely infer an intention or deed that is not there. Or one can fail to infer an intention or deed that is there. A spouse might falsely suspect a partner of sexual treachery, for example, or fail to infer an extant infidelity. Both errors cannot simultaneously be minimized. Setting a low threshold for inferring infidelity, for example, minimizes missed detections, but simultaneously increases false accusations. Setting a higher threshold for inferring infidelity minimizes false accusations, but simultaneously increases missed detections.

According to *error management theory* (EMT; Haselton & Buss, 2000), it would be exceedingly unlikely that the cost-benefit consequences of the two types of errors would be identical across their many occurrences. We intuitively understand this in the context of smoke alarms, which are typically set sensitively. The costs of the occasional false alarm are trivial compared with the catastrophic costs of failing to detect a real house fire. EMT extends this logic to cost-benefit consequences in evolutionary fitness.

According to one EMT hypothesis, the recurrent fitness costs of failing to detect spousal infidelities typically would have been greater than the costs of occasional false

suspensions (Buss, 2000a). An unknowingly cuckolded man, for example, would have risked investing in a rival's children in the mistaken belief that they were his. An unknowingly betrayed woman would have risked the diversion of her partner's resources and commitments to another woman and her children, producing cascading costs for her own children.

Cognitive Biases

According to EMT, asymmetries in the cost-benefit consequences of social inferences, if they recur over evolutionary time, create selection pressures that produce predictable *cognitive biases*. Just as smoke alarms are biased to produce more false positives than false negatives, EMT predicts that evolved information processing procedures will be biased to produce more of one type of inferential error than another. The direction and degree of bias, of course, greatly depend on such factors as context and gender. Inferences about the sexual intentions of a potential romantic partner, for example, carry a different cost-benefit calculus than inferences about the level of commitment in a current romantic partner. The cost-benefit consequences of particular types of inferential errors differed for men and women, according to EMT, producing different inferential biases in men and women. No prior psychological theory of cognitive biases predicts these sex differences. Nor do prior theories hypothesize different sex-linked inferential biases depending on domain.

Sexual Overperception and Commitment Skepticism

Empirical research has confirmed several hypotheses derived

from specific applications of EMT (Haselton & Buss, 2000). It has been used to explain the sex-linked *sexual overperception bias*, whereby men are hypothesized to possess mind-reading biases designed to minimize the costs of missed sexual opportunities. EMT provides a cogent explanation, for example, of why men appear to falsely infer that a woman is sexually interested merely when she smiles or touches a man's arm. Furthermore, this EMT-based hypothesis predicts specific contexts in which the bias will disappear, such as when the target woman is genetically related to the man in question or low in reproductive value.

Another application of EMT has predicted an opposite sort of cognitive bias in women, the *commitment-skepticism bias*. According to this hypothesis, women have evolved an inferential bias designed to underestimate men's actual level of commitment early in courtship in order to minimize the costs of being sexually deceived by men who feign commitment (Haselton & Buss, 2000). If men give flowers or gifts to women, for example, third-party observers infer that the men are signaling greater commitment than do the women who are the recipients of these displays, who show greater skepticism about the depth of the men's feelings.

EMT also predicts cognitive biases linked with sexual jealousy that lead to false inferences of a partner's sexual infidelity (Buss, 2000a). Men and women, in very predictable contexts, sometimes have false beliefs that a partner is unfaithful when he or she has in fact remained loyal. This bias appears to get especially activated in social contexts that historically have tended to be linked with infidelity, even if the target person has never been betrayed. A partner's sexual dissatisfaction, a sudden decline in sexual desire, and an increasing gap

in desirability between the two partners, for example, all trigger suspicions of infidelity. Modern humans appear to have inherited ancestral tracking devices that signal circumstances indicating a statistical likelihood of infidelity, even if these procedures produce false positive errors (Buss, 2000a).

EMT offers a fresh perspective on cognitive biases by suggesting that certain types of inferential errors represent adaptive errors rather than design flaws in the psychological machinery (Haselton & Buss, 2000). It has provided new insights into why men and women get into certain types of conflict—for example, men's sexual overperception bias can lead to unwanted sexual overtures. Although extant empirical tests of EMT have borne fruit, only future work can determine whether this theory will provide a more general theory of cognitive biases. Nonetheless, EMT has been a source of inspiration for novel hypotheses about cognitive biases (e.g., commitment-skepticism bias), raised suspicions of some traditional explanations (e.g., that errors necessarily represent design flaws in human cognition), and suggested novel predictions about when biases occur (e.g., contexts in which false accusations of infidelity will occur).

STRATEGIC INTERFERENCE THEORY: "NEGATIVE" EMOTIONS AND CONFLICT BETWEEN THE SEXES

Conflict between the sexes is not produced solely from passionless cognitive biases. *Strategic interference theory* posits that emotions are psychological mechanisms that evolved in part to grapple with particular forms of conflict (Buss, 1989, 2000a). In the scientific history of emotions research, many theorists have contrasted "emotion-

ality" with "rationality" (see Frank, 1988). According to this view, rationality is what causes humans to make sensible decisions. When faced with a problem, we use reason and logic to reach rational solutions. Emotions, according to this view, only get in the way—anger addles the brain; fear distorts reason; jealousy clouds the mind. Emotions are presumed by some theorists to be unfortunate relics from an ancient time in which human ancestors acted more from instinct than from logic. Psychologists have labeled anger, fear, and jealousy the "negative" emotions, presumably because they need to be controlled, reigned in, and subdued so that they do not impede rational action.

Negative Emotions as Functional

According to strategic interference theory, these emotions are adaptively designed to solve problems of strategic interference (Buss, 1989). Strategic interference occurs whenever something or someone impedes or blocks a preferred strategy or set of goal-directed actions. It is hypothesized that the negative emotions have been (and perhaps continue to be) beneficial, serving several related functions. First, they focus attention on the source of strategic interference, temporarily screening out other information less relevant to the adaptive problem. Second, they prompt storage of the relevant information in memory so that it is available for subsequent retrieval under appropriate circumstances. Third, they motivate action designed to eliminate or reduce strategic interference. And fourth, they motivate action designed to avoid future episodes of strategic interference.

Because men and women have evolved somewhat different sexual strategies, the events that cause strategic interference are predicted

to differ for the sexes. Therefore, the events that trigger emotions such as anger, jealousy, and subjective distress should differ for the sexes. This theory has heuristic value in guiding researchers to phenomena not predicted by other theories. No other theory of emotions, for example, predicts fundamental sex differences in the events that elicit these emotions.

Strategic interference theory has been tested empirically in several domains. In the domain of sexual strategies, research has shown that the patterns of men's and women's anger correspond precisely to their respective sources of strategic interference (Buss, 1999). Women, far more than men, become angry and upset by individuals who seek sex with them sooner, more frequently, and more persistently than they want. Men, far more than women, become angry and upset by individuals who delay sex or thwart their sexual advances.

Jealousy and Sexual Rivalry

More subtle tests of strategic interference theory have taken place in the domains of jealousy and same-sex rivalry. One series of studies conducted in Korea, Japan, and the United States discovered large and cross-culturally consistent sex differences in whether sexual or emotional betrayal by a partner was more distressing (Buss et al., 1999). These sex-linked emotional reactions were precisely predicted from the premise that sexual infidelity by a man's partner interferes with his strategy of monopolizing her reproductive capacities, producing paternity uncertainty. Emotional infidelity by a woman's partner interferes with her strategy of monopolizing a man's commitments and resources, which could get diverted to a rival woman and her children as a consequence of a man's emotional involvement.

Another domain in which strategic interference theory has been tested pertains to the specific qualities of mating rivals that evoke distress. Because women and men have evolved somewhat different mate preferences, the qualities of intrasexual rivals that will be alluring to one's partner should differ for the sexes (Buss & Schmitt, 1993). Interested rivals inflict strategic interference when they possess these desirable qualities. Partners inflict strategic interference when they are attracted to desirable rivals.

Parallel studies conducted in the Netherlands, the United States, and Korea documented these sex differences (Buss, Shackelford, Choe, Buunk, & Dijkstra, 2000). Dutch, American, and Korean men, more than their female counterparts, reported particular emotional distress when a rival surpassed them on financial prospects, job prospects, and physical strength. Dutch, American, and Korean women, in contrast, reported greater distress when a rival surpassed them on facial attractiveness and body attractiveness. Although the cultures differed in some respects, and the sexes were similarly distressed by rivals who exceeded them on qualities such as kindness and sense of humor, the study demonstrated sex differences in emotional distress precisely for those rival characteristics predicted by strategic interference theory.

The so-called negative emotions, in short, may represent ancestral wisdom, inherited from a long line of successful ancestors who acted to minimize strategic interference. Emotions, far from distorting reason, may alert us to particular ways in which others may be impeding our preferred strategies. Emotions motivate efforts to reduce impedance. Strategic interference theory has inspired several novel hypotheses, raised suspicion

of the common view that negative emotions interfere with reason, and led to the discovery of important sex differences in emotional experience that prior approaches had not uncovered.

CONCLUSIONS

Conflict between the sexes and conflict surrounding sex are ubiquitous phenomena in group-living species. The proposal that humans have evolved psychological mechanisms to deal with cross-sex interactions does not imply that what was ancestrally adaptive is necessarily currently functional in modern environments. Nor does it provide a panacea for reducing conflict between the sexes. In fact, it highlights some important obstacles to personal happiness and social harmony—emotions designed to produce subjective distress, inferential biases designed to produce errors, and mechanisms that benefit one person at the expense of others (Buss, 2000b).

Cautious skepticism is appropriate when evaluating new psychological approaches, and many critical issues remain unresolved. Will EMT lead to the discovery of additional cognitive biases beyond those discussed here, such as functional overestimates of other people's homicidal intentions (Buss & Duntley, 2001)? Will EMT prove capable of explaining well-documented cognitive biases, such as the tendency for people to overestimate their likelihood of success at certain tasks? Will EMT furnish a more powerful explanation than traditional treatments of cognitive biases, which typically invoke limited cognitive capacity, simplifying heuristics, and information processing shortcuts?

Similar unresolved issues remain for strategic interference theory. Will it continue to lead to the

discovery of new phenomena that must be explained by any comprehensive theory of emotions, such as the connection between specific forms of cross-sex deception and sex-linked anger (Haselton & Buss, 2001) and the difficulty men and women often have in being "just friends" (Bleske & Buss, 2000)? How will strategic interference theory be integrated into a more comprehensive theory that includes both positively and negatively valenced emotions?

Psychology during the past few decades has delighted in demonstrating that humans are irrational information processors—cognitive heuristics produce bias, emotions cloud reason. But what is properly regarded as rational or irrational must be evaluated by the criterion of what problems particular mechanisms are designed to solve. Smoke alarms are biased—they produce many false positives. But they are not "irrational." Humans are designed to solve social adaptive problems. These include grappling with strategic interference. They also include making inferences about the differently constituted

minds of the opposite sex. Within these and perhaps other domains, emotions may be rational and cognitive biases functional.

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Note

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