

Problems of Development & Learning

Theories of Emotions

6.1 Evolutionary Theories of Emotions

Although numerous adaptive-evolutionary treatments of emotion have emerged over the years (e.g., Ekman & Davidson, 1994; Plutchik, 1994), an *evolutionary-psychological* approach distinguishes itself from other evolutionary approaches by adopting an explicitly adaptationist perspective (Barkow, Cosmides, & Tooby, 1992). An adaptationist perspective is guided by the simple assumption that the mind is comprised of many mental adaptations, each of which is the product of natural and sexual selection operating over many generations during the course of human evolution (Buss, Haselton, Shackelford, Bleske, & Wakefield, 1999).

Our ancestors faced a multitude of adaptive problems—evading predators, gathering food, finding shelter, attracting mates, caring for kin, and communicating with conspecifics, to name just a few (Barkow, Cosmides, & Tooby, 1992; Buss, in press). Because each of these adaptive problems required a unique solution (escaping a predator involves different skills than acquiring a mate), evolutionary psychologists argue that we should expect that our minds consist of a great variety of distinct psychological mechanisms, each shaped to address a specific adaptive challenge (Barrett, 2005; Symons, 1979). Similarly, we argue that it is reasonable to expect that humans have evolved a multitude of distinct emotions, each designed to deal with a specific set of adaptive problems.

Emotions affect the way that we think and behave in a variety of personal and social contexts. Evolutionary approaches to emotion and social decision-making have ranged from broad theoretical models of emotion (Buck, 1999; Cosmides & Tooby, 2000; Tooby & Cosmides, 1990) to empirical investigations of specific emotions (Ketelaar & Au, 2003). One of the broadest theoretical approaches to emotion and decision-making (emotions-as-commitment devices) uses the tools of experimental economics to explore game-theoretic aspects of emotions. A second theoretical approach proposes that emotions are superordinate cognitive programs that coordinate thoughts and behaviors in response to specific adaptive challenges.

We describe each of these approaches before turning to a brief review of recent empirical research linking specific emotions to specific adaptive problems.

6.2 Emotions as Commitment Devices

Humans can be coldly calculating and selfish, and like many animals, humans have preferences for immediate gains due to heavy discounting of the future. Theorists from Adam Smith (1759) to Robert Trivers (1971) and more recently economists Jack Hirschliefer (1987) and Robert Frank (1988), have argued that emotions operate as mechanisms for sustaining subjective commitments to strategies that run counter to speciously attractive immediate rewards. Frank summarized the logic of the theory as follows (Frank, 1988, p. 82):

The idea is that if the psychological reward mechanism is constrained to emphasize rewards in the present moment, the simplest counter to a specious reward from cheating is to have a current feeling that tugs in precisely the opposite direction. ...because [the emotion] coincides with the moment of choice...it can negate the spurious attraction of the imminent material reward.

Frank illustrated this view with examples of how emotions such as love and guilt can influence social decision-making. When one experiences feelings of love for a romantic partner, for example, the immediate positive reward the emotion produces counteracts the pull of desire for an attractive other. Likewise, feelings of guilt immediately punish thoughts of selfishly cheating an ally and thus prevent the individual from compromising a cooperative relationship.

In doing so, these emotions help us to stick with strategies that lead to rewards in the long run despite the fact that they often necessitate forgoing smaller immediate gains. For example, if one were drawn away from every possible romantic commitment by the prospect of finding a still more attractive mate, one could never reap the fitness benefits of long-term mateship, including cooperative child rearing (Hurtado & Hill, 1992; Marlowe, 2003; Pillsworth & Haselton, 2005) and assurance of mutual care in times of dire need (e.g., Nesse, 2001).

The bulk of the work on the commitment-device theory has been purely analytical (e.g., testing theoretical assumptions with mathematical models; see Hirshliefer, 1987, and Nesse, 2001, for reviews). Recently, however, this theory has also been subject to empirical tests. For example, in one study of the effects of guilt on cooperation, participants played an Ultimatum Game and emotions recorded after

the first transaction were used to predict behavior one week later (Ketelaar, & Au, 2003). In an Ultimatum Game, participants are assigned the role of the proposer or respondent. The proposer is allotted a sum of money and allowed to give some percentage of it to the responder, who then decides whether to accept or refuse the offer. If the offer is accepted, the proposer and respondent split the money as proposed; if the offer is rejected neither party receives any money.

In this study, the researchers found that over 90% of subjects who felt guilty after proposing an unfair offer (less than 50-50 split) reversed their behavior a week later and made a generous monetary offer (Ketelaar & Au, 2003). By contrast, less than 25% of the individuals who experienced no feelings of guilt made a similarly generous offer; in fact, the vast majority of them (75%) continued making selfish offers a week later. The effects of guilt on social decision-making observed in this study are consistent with the claim that individuals under the influence of certain emotions often make decisions that forego immediate benefits in favor of more profitable long-term outcomes (e.g. a cooperative alliance; Frank, 1988).

In sum, the immediate rewards or punishments that we feel when we experience certain emotions can serve as a potent counterweight to our tendency to overweight short-term gains. These emotions may appear irrational in the short run because they lead us to forgo sure gains, but ultimately they lead us to acquire still greater long-term benefits.

6.3 Superordinate Coordination Theory

Perhaps the broadest and most inclusive evolutionary theory of emotions is one that views these states as superordinate cognitive programs. If evolution has created a multitude of “microprograms,” serving many different functions with outputs that sometimes conflict, there must be some way for the brain to selectively activate only the subset of programs needed when an organism faces a particular adaptive problem. Otherwise, the action of these mechanisms would be chaotic and self-defeating—does one flee or court, collect food or seek shelter, sleep or eat?

Cosmides and Tooby (2000; Tooby & Cosmides, 1990) propose that the emotions serve precisely this sort of governing function by orchestrating systems of perception, attention, goal pursuit, and energy and effectiveness, as well as by activating specialized inferences, recalibrating decision weightings, and regulating behavior. They illustrate using the emotion of fear: You can imagine walking alone at night and hearing some rustling in the brush. Your energies are aroused to ready

you for action, you become acutely aware of sounds that could indicate that you are being stalked, the threshold for detecting movement is lowered, you no longer feel pangs of hunger, attracting a mate is the farthest thing from your mind, you recall where there are good places to hide, and you act—by running, hiding, fighting, or ceasing all movement, depending on the circumstances.

Cues associated with ancestrally recurrent threats and opportunities such as being cloaked in darkness, viewing naked, nubile mates, or smelling delicious food can automatically turn on particular emotions, thereby activating specialized strategies that in ancestral environments would have led to targeted adaptive responses. Our everyday experiences provide evidence that this general hypothesis holds some merit. Fear, for example, results in protective responses including flight, whereas sexual desire results in the pursuit of a desired mate.

In the next section, we also describe several lines of research demonstrating that

- 1) ancestrally recurrent cues readily elicit specific emotions and
- 2) specific emotions lead to targeted, functional outcomes. The relevant literature has grown substantially over the last several decades (see Haidt, 2003; Keltner & Haidt, 1999; Ketelaar, 2005 for reviews).

In our brief review, we have selected examples that:

- 1) Demonstrate the function-specificity of emotions,
- 2) Would be difficult to understand without evolutionary theorizing, and
- 3) Represent the latest updates on important theoretical questions in the study of emotion.

6.4 Ancestral Cues Elicit Specific Emotions Fear & Ancestral Sources of Danger. As we have already hinted, perhaps nowhere does there exist better evidence for the domain-specificity of emotion than in the domain of fear. Modern environments possess an abundance of lethal threats that hardly evoke a moment's notice. Humans routinely operate speeding automobiles, work around sources of electrical hazard, and expose themselves to carcinogenic agents without breaking a sweat.

Yet, a single harmless stinging insect can bring about behavioral changes that are detectable for several city blocks. Why do humans appear to lack fear of objects that can kill (automobiles and electrical outlets) and yet display an almost debilitating fear of objects that present only a small threat (spiders and snakes)? In this section, we illustrate how an adaptationist view on the functional-specificity of

emotions allows us to make sense of this otherwise puzzling array of fear responses.

Evolutionary psychologists argue that the non-random distribution of fear stimuli is a legacy of the evolutionary past. The absence of fear responses to evolutionarily novel sources of danger (automobiles, electrical outlets, etc.), for example, suggests that emotional responses are not simply the product of rational deliberation. Instead, human fears are the result of domain-specific mechanisms that correspond to ancient sources of harm such as dangerous animals, bodily insults, heights, social evaluation, and the risk of social exclusion (Costello, 1982; Marks & Nesse, 1994; Nesse, 1990; Ohman & Mineka, 2001; Seligman, 1971).

Snake fear is perhaps the best researched example. Although snakes do not pose much of a risk in modern environments, snakes and humans have coexisted for millennia and snake bites can be lethal. In the laboratory, researchers can condition people to fear snakes and snake-like stimuli using mild electrical shocks. By contrast, it is difficult to condition fear to other stimuli, even those with strong semantic associations with shock (e.g., damaged electrical outlets; see Ohman & Mineka, 2001 for a review). Unlike responses to evolutionarily novel sources of harm, biologically prepared fear responses (snakes, spiders, etc.) are notoriously difficult to extinguish (see Mineka, 1992; Cook & Mineka, 1990; Nesse, 1990; Marks & Nesse, 1994; Seligman, 1971 for reviews).

6.5 Specific Emotions and Sex-Linked Adaptive Problems

Function specificity is evident not only in cross-species conflicts (humans vs. dangerous animals), but also appears in a variety of within-species conflicts for which humans appear to have evolved special-purpose emotional machinery. For example, men and women have historically faced different adaptive problems in the domain of mating, and evolutionary psychologists have therefore proposed that the sexes have evolved different solutions to a number of sex-linked adaptive problems.

Differences in parental investment can produce some of the largest conflicts between the sexes. Because men's reproductive investments can be very small, the upper limit on reproductive success for males is predicted, quite simply, by the number of fertile partners to whom they gain access (Symons, 1979; Trivers, 1972). Women's investments, on the other hand, are always large—at minimum 9

months of pregnancy, typically followed by years of breastfeeding in traditional societies. Thus, the optimal strategy for a man and a woman will often be in conflict. For women, mate quality looms larger than mate quantity, whereas for some men who are able to successfully pursue a short-term mating strategy, the reverse can certainly be true (Gangestad & Simpson, 2000), and a variety of robust sex differences support this proposal. Women, for example, tend to desire longer delays before sex in order to assess a mate's quality and disposition to invest. Men, on average, desire sex earlier in relationships and they maintain a desire for sexual variety even after finding a long-term mate (Schmitt et al., 2003; also see Buss, 2003, for a review).

Differences in the evolved desires that underpin these sex-differentiated adaptive problems can result in sexual strategies that produce conflict. Buss (1989) proposed that negative emotions such as anger and fear may aid an individual in dealing with the attempts of others to interfere with one's strategic goals: When a source of interference is detected, negative emotions (e.g., anger) can draw attention to the source of interference, mark important events for storage in memory, and activate behavioral routines that serve to minimize current and future interference. To the degree that the sources of strategic interference differ between the sexes, one expects to observe sex differences in the emotional responses that they elicit.

An extensively-researched example is sexual jealousy. Due to internal female fertilization, men are uncertain of paternity, whereas women are always certain of maternity and hence they do not face this problem. Thus, evolutionary psychologists proposed that men should experience greater jealousy in response to cues to sexual infidelity than women do (Daly, Wilson, & Weghorst, 1982; Buss et al., 1992).

Although research on this hypothesis is fraught with controversy (Buller, 2005; Buss & Haselton, in press; Harris, 2003; Sagarin, 2005), the bulk of the evidence, including many cross-cultural studies, has found that men report greater jealousy in response to imagined infidelity than do women, though clearly both men and women find all forms of infidelity extremely upsetting (e.g., Buss et al., 1992; Buss & Haselton, in press; Haselton, Buss, Oubaid & Angleitner, 2005; Sagarin, in press). Also consistent with the jealousy hypothesis, men express more jealousy if their partners are higher in reproductive value (younger and or more attractive; Buss & Shackelford, 1997) and when their partners are nearing ovulation and the

likelihood of extra-pair conception as a result of an affair is greatest (Gangestad, Thornhill, & Garver, 2002; Haselton & Gangestad, 2005).

In the realm of mating deception, women respond with far greater upset in response to a partner exaggerating his feelings in order to have sex or failing to maintain commitments after sex, whereas men respond with greater upset in response to being sexually led on (Haselton et al., 2005). Deceptive exploitations of sex-linked mate preferences also produce sex differences in degree of emotional upset. Women are more upset if a partner exaggerates his income or status, whereas men's upset is piqued by a long-term partner exaggerating her faithfulness or underreporting her level of sexual experience (Haselton et al., 2005).

Emotions also track experience-contingent shifts in costs and benefits for the sexes. First-time intercourse signals the possibility of pregnancy for a woman and therefore the importance of securing commitment from her partner. For men who pursue a short-term mating strategy, first-time sex signals both that a goal has been achieved and that there is a possibility of becoming entangled in an unwanted long-term relationship.

After first-time sex, the feelings men and women experience do indeed differ. Women more than men experience a positive affective shift toward increased feelings of commitment for their partners (Haselton & Buss, 2001), whereas, men who have had many sex partners (and therefore successfully pursue a short-term strategy) experience a negative affective shift marked by a drop-off in physical attraction to their partners (Haselton & Buss, 2001). These effects are hypothesized to prompt behaviors to secure investment (for women) or to extricate oneself from a potential romantic entanglement (for short-term oriented men).

The sexes may also differ in their feelings of regret surrounding sex. The affective experience of regret is hypothesized to function to improve future decision making by enabling people to avoid mistakes that have important consequences (Roese, 2005; Haselton, Poore, von Hippel, Gonzaga, & Buss, 2005; Zeelenberg, 1999). If this hypothesis is correct, feelings of regret should track sex-differentiated adaptive problems including problems of careful partner choice for women (more than men) and problems of attracting multiple mates for men (more than women).

Haselton and colleagues proposed that missed sexual opportunities (sexual omission) would have been more reproductively costly for ancestral men than for women, whereas sexual encounters with an undesirable or non-investing partner (sexual commission) would have been more reproductively costly for women than

for men (Haselton et al., 2005). As predicted, in response to hypothetical regret scenarios, women more than men reported that they would regret having sex in a relationship that turned out to be only short-term, whereas men more than women reported they would regret missing an attractive sexual opportunity (Haselton et al., 2005). These effects were corroborated by participants' spontaneous reports of past experiences: although women and men both listed more sexual commission regrets than sexual omission regrets, women reported that they regretted acts of sexual commission more intensely than did men.

In sum, there is growing evidence that the emotions men and women experience are differentially sensitive to cues linked with the specific adaptive problems each sex faced during evolutionary history. Men react more strongly to sexual infidelity, being sexually led on, and being deceived about a partner's tendency to be faithful.

Men experience predictable affective shifts after first-time sex, and they report that they would strongly regret missed sexual opportunities. Women, on the other hand, react more strongly to being deceived about a man's level of commitment in order to get sex and about his level of status. Women experience a predictable increase in feelings of commitment to a partner after first-time sex, and they experience stronger regrets after having sex with a partner who turned out not to be desirable as first believed.

6.6 The Function-Specificity of Moral Disgust

Emotions should be sensitive not only to the on-average differences in fitness costs and benefits between the sexes but also to individuating circumstances that confront members of the same sex. We now turn to two such examples in the domain of disgust.

Many theorists have proposed that disgust is designed to reject toxic or pathogenic substances and to prevent costly sexual behaviors—for example, engaging in sex with biological relatives. Many sources of evidence indicate that feelings of disgust are indeed opposed to feelings of sexual desire (see Fessler & Navarrete, 2003, for a review).

Lieberman (2003; Lieberman, Tooby, & Cosmides, 2003) proposed that a reliably occurring cue to siblingship is coresidence during childhood, and therefore length of co-residence should be associated with greater disgust in response to imagined sexual activities with a sibling and to greater moral disapproval of third party

incest. Not surprisingly, Lieberman found that length of co-residence strongly predicted degree of relatedness, but length of co-residence also positively predicted the degree of disgust men and women reported in response to imagining sexual activities with siblings, ranging from tongue-kissing to having sexual intercourse (Lieberman, 2003; Lieberman et al., 2003).

Siblings who co-resided for longer periods of time also expressed greater moral sentiments prohibiting sex between relatives (Lieberman et al., 2003; also see Fessler & Navarrete, 2004, for converging results). Co-residence time predicted incest aversions after controlling for actual degree of relatedness, suggesting that time spent living together is possibly the cue to which the evolved psychology of incest avoidance is most strongly attuned (Lieberman et al., 2003). These results are striking given that the subjects in these studies (Western undergraduates) have access to explicit information about true sib-ship, and yet the effects of relatedness are trumped by the hypothesized ancestral cue (co-residence).

The onset of ovulation signals greater risk of conception for women and hence greater costs of suboptimal matings. Thus, Fessler and Navarrete (2003) proposed that near ovulation women should experience greater disgust sensitivity in the sexual domain but not in other domains (e.g., food, body envelope violations, or hygiene). As predicted, they found that women's probability of conception based on self-reported cycle day significantly predicted disgust sensitivity in the sexual domain, and only in the sexual domain, of the Disgust Scale (Haidt et al., 1994). In sum, these results demonstrate that two cues which were likely to predict ancestral costs of sex—length of co-residence and female cycle position—elicit sexual disgust.