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27 Emotion, Warnings, and the Ethics of Risk Communication

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Introduction 694

History 696

 Why Emotional Appeals Can Be Effective 696

 Experienced Emotions and Decision-Making 697

 Interactions of Emotion and Reason in Decision-Making 698

Current Research 699

 Affective Versus Rational Modes of Cognition 699

 Levels of Cognitive Processing in Judgment 699

 Brain Lateralization and Style of Cognitive Processing in Judgment 702

 Valence Versus Discrete Emotion Approaches 707

 Valence Approaches 707

 Discrete Emotion Approaches 708

 Effective Public Health and Safety Appeals 711

 Uncovering Specific Emotional Influences: An Application to Safer Sexual Behavior 712

Further Research 715

 Emotion Intervention Strategies: Emotional Education and Emotional Competence 715

Conclusion 717

Abstract: In constructing warning messages, analytic-cognitive factors have traditionally been stressed: having script and/or images of sufficient size and legibility which show dangerous consequences and communicate how they can be avoided and safety maintained. Emotional, or affective-cognitive, factors have rarely been considered in the design of warnings. Indeed, employing emotional appeals to persuade an audience is widely regarded to be unethical, smacking of manipulation. However, emotional factors have been employed with great effectiveness in advertising and marketing, sometimes to actually weaken legitimate safety concerns. Advertisements for dangerous products routinely ignore risk or if required present warning information in a form that is easily overlooked or disregarded. However, emerging research on decision-making has found that emotion plays a critical role in reaching optimal conclusions. It is now recognized that emotional or affective-cognitive factors can influence judgment processes in many ways. First, there are immediate emotions involved in the decision itself, and the emotions anticipated to flow from the decision. Second, there are emotions intrinsic to the decision that may be evoked by the message itself, and emotions incidental to the decision that nevertheless may influence the outcome. Third, emotion can influence the degree of rationality or mindfulness in the deliberation itself. Effective warnings must command attention, stimulate memory, and evoke emotion, as well as communicate consequences and safe behavior. In addition, to construct effective warnings, one must recognize the emotions that people are likely to experience in dangerous situations, and help them to understand those feelings and desires in a context of mindfully managing risk.

Introduction

Emotional appeals have historically been viewed as morally inferior to rational presentations of objective risk information. Emotional appeals are often regarded as manipulative and unethical, because they intentionally target processes that may be outside an individual's awareness in an attempt to produce a desired behavior (See Buck and Davis 2010). Emotional appeals have been strongly criticized as diminishing the "manipulee's" abilities to make free and rational choices (Beauchamp 1988). Threat-based emotional appeals in particular have been described as explicitly using "the force of fear to try to manipulate human behavior" (Hastings et al. 2004), and have been denigrated for creating unnecessary consumer anxiety (Benet et al. 1993). These judgments persist even when critics acknowledge that social advertisers have good intentions (Arthur and Quester 2003). As such, officials often feel obligated to present risk information in a fashion that is as objective as possible, presenting only "factual" information about the numerical risks of a behavior, technology, or situation, and the potential benefits – again, framed in terms of change in objective risk – of a preventive behavior. This is intended to allow the public to make an autonomous, but informed, choice (see Buck and Davis 2010 for a detailed discussion). However, we argue that objectively presenting risk information outside of the context of emotion may not be the best, or morally preferred, strategy for two key reasons.

First, and importantly, emotional appeals have long been employed in the advertising field, where they can promote the mindless acceptance of risk (Buck and Davis 2010). For example, the popular advertising technique of *branding* involves using advertisements to encourage the public to associate emotionally charged images and videos with a certain consumer brand name. The intended outcome of this technique is essentially to increase positive emotions associated with the brand, which in turn directly and positively impacts purchase behavior

(e.g., [Greifender et al. 2007](#); [Pritchard and Morgan 1998](#)). For example, through Nike's "Just Do It" campaign, consumers learn to associate with the Nike brand affectively laden images of fit, strong, and attractive elite athletes engaging in action-packed sporting activities, and the associated feelings of accomplishment, pride, and body satisfaction.

The consequences of these types of advertisements to the public may not be dramatic, beyond an increase in consumer spending on Nike products. However, emotional appeals in the media are not always so seemingly innocuous. In televised drug advertisements, the presentation of required information about significant side effects is often presented with images of health and happiness accompanied by soothing music, this emotional content directly contrasting with the information about risk presented often with rapid verbalization. Moreover, many advertising campaigns for tobacco and alcohol products promote unhealthy smoking or drinking behavior by linking their brands to affectively laden images associated with being fun-loving, popular, young, and loved. These types of advertisements have been utilized, with much success, by the tobacco and alcohol industry for decades, and they belie the small "warning labels" imposed on tobacco and alcohol products. In another example, fast food campaigns have successfully linked their brands with emotions associated with family and fun, such as loyalty, love, pleasure, and satisfaction. These emotional appeals in advertising are well-documented and quite effective in creating sustained changes in consumer behavior (e.g., [Chaudhuri 2006](#)), including increases in consumption of harmful products like cigarettes or unhealthy foods. These emotional appeals divert attention from potentially harmful effects of these behaviors, resulting in the mindless acceptance of risk on the part of consumers ([Buck and Davis 2010](#)).

Effective emotional risk messages by the public health field have the potential to counter these harmful emotional appeals from the advertising industry, and there are relevant examples. For example, cigarette packages in Canada and Brazil have been required to include large color photographs illustrating the harmful effects of smoking: preterm birth, impotence, tooth decay, cancer ([Buck and Davis 2010](#)). New US Food and Drug Administration regulations will similarly require such images to be introduced in the USA. However, risk communicators often miss the opportunity to make a difference in these behaviors by attempting to counter the advertising industry's emotional appeals with often ineffective appeals to reason. If emotional appeals are more effective than appeals to reason, it begs the question: Is it really more ethical to present objective and rational risk information when emotional appeals can promote behavior that is in the public's best interest? In a related line of reasoning, [Thaler and Sustein \(2008\)](#) argue that the choice environment and public policy affect decision-making at the individual level, and that policy makers have an obligation to structure choices in such a way that it "nudges" individuals toward decisions that are in their own best interest without forcing these choices.

A second reason that objectively presenting risk information may not be the morally preferred strategy is that, although emotional appeals in risk communication have been seen as unethical, it can be argued that all public health and safety appeals are emotional to some degree, since all perceptions and messages contain some affective component ([Zajonc 1980](#)). Indeed, [Hilton \(2008\)](#) argues that though the pragmatic view of communication calls for information to be presented in an objective way so that the decision maker may accurately interpret alternatives and make autonomous decisions, our language is structured in such a way that it always has evaluative properties, and even minor variances in sentence structure convey evaluation and emotion. This assertion is supported by examination of the effectiveness of warnings. A meta-analytic review of warnings indicated that, though warnings have a modest effect overall, there is considerable variability, with some

warnings producing behavior that is actually more unsafe than the behavior of the comparison group who does not receive a warning (Cox et al. 1997). Arguably, if individuals were behaving “rationally” and emotions were not aroused by warning messages, these warnings would either have a positive effect on behavior, or would have no effect if other considerations (e.g., pleasure in the risky behavior) trumped the risk information. However, the presence of these unintended boomerang effects of warnings indicates that there are some “irrational,” and perhaps emotional, effects of messages that are intended to be neutral. Thus, we argue that although emotion has been largely overlooked in the design of safety and public health risk messages, emotion is still present in these messages. If risk communicators always convey some emotion in their messages and warnings (Hilton 2008) and create an environment that predisposes certain choices (Thaler and Sustein 2008), is it truly unethical for them not to carefully target the emotional reactions they want to elicit based on empirical evidence in the field of emotion and decision-making?

Because it may be impossible to present information in a disinterested and unemotional manner, and because emotional appeals have the great potential to counter emotional appeals in the advertising industry that mindlessly promote the acceptance of risk, we submit that it is therefore the responsibility of health and safety officials to use emotions effectively to communicate information necessary for individuals to act in their own best interests. Here, we present support for the use of emotional appeals in warnings and risk messages, supporting the assertion that emotional appeals are not only ethical, but also essential in creating effective risk messages. The chapter reviews research concerning emotion and decision-making, and addresses neurobiological determinants of emotion and the implications for judgment and decision-making involving risk. We note the increasing appreciation of the role of emotion in decision-making and persuasion in recent years, after the long period of relative neglect in which rational information processing was emphasized. We conceptualize emotion in terms of affective cognition, and reason in terms of rational cognition, as detailed later in this chapter. The resulting “new look” in decision and persuasion theory has far-reaching implications for both theory and practice in the social and behavioral sciences. It also has the potential to bring academic theory and research more into line with approaches in the private sector, which has long used emotional appeals very effectively to steer decision-making, and indeed as noted at times deliberately to promote mindlessness and unwarranted risk-taking. We close the chapter with recommendations for future directions in emotional risk communication research, as well as recommendations for effective risk communication strategies that appeal to emotions in systematic and empirically driven ways.

History

Why Emotional Appeals Can Be Effective

It is now recognized that emotion, or affective cognition, can influence judgment processes in many ways. First, there are immediate emotions involved in the decision itself. For example, decisions involving risky sexual behavior can be influenced by arousal, excitement, and enthusiasm that may impede feelings of apprehension that might be anticipated were considerations of security and safety more salient. Second, there are emotions intrinsic to the

decision, and emotions incidental to the decision that nevertheless may influence the outcome. Unwise decisions about having risky sex may be greatly facilitated both by an attractive and engaging partner, and by a party atmosphere evoking the very excitement and arousal that motivate the risky behavior. Third, emotion may influence the degree of rationality or mindfulness in the deliberation itself. Here, we provide evidence for the crucial role of emotions in judgment and decision-making.

Experienced Emotions and Decision-Making

As Damasio and colleagues have argued, emotion plays a critical role in adaptive judgment and decision-making (e.g., Damasio 1994; Bechara et al. 1997). One category of emotion that influences decision-making is “experienced emotion,” which can be both affective cognitions that are relevant to the decision (anticipatory emotions) and affective cognitions that are not directly relevant to the decision but influence it nonetheless (incidental emotions; Han et al. 2007; Loewenstein and Lerner 2003; Loewenstein et al. 2001). Anticipatory emotions are actually experienced at the time of the decision in response to cognitive representations of potential outcomes, and have been shown to influence behavior (Bagozzi et al. 1998). For example, when thinking about an upcoming vacation, one may actually *feel* excitement or contentment, rather than simply cognitively anticipating that these emotions may occur during the vacation in the future. Similarly, when thinking about being diagnosed with cancer, one may actually *feel* worry, dread, or anxiety, rather than simply cognitively anticipating that these emotions may occur during a hypothetical future diagnosis.

Incidental emotions may also be experienced at the time of the decision, but be unrelated to the decision; these also have a demonstrated relationship with behavioral decisions (e.g., Grunberg and Straub 1992; Harle and Sanfey 2007; Lerner and Keltner 2001; Lerner et al. 2004). For example, one may feel sad after watching a depressing movie, and though that sadness has no relationship to a decision about whether to purchase a product or engage in a particular health or safety-related behavior, it may influence that decision nonetheless. Though experienced emotions, both anticipatory and incidental, can be fleeting, their influence on decision-making can endure long after the emotional experience has ceased, perhaps because of the need to behavioral consistency (Andrande and Ariely 2009).

Additionally, anticipated emotions play a role in decision-making. These refer to cognitive conceptualizations of anticipated future emotions. Though anticipated emotions are not experienced at the time of the decision, they can contribute to the information that influences experienced anticipatory emotions, and can also contribute to decision-making at the cognitive level (Loewenstein and Lerner 2003; Loewenstein et al. 2001). For example, thinking about failing an examination in the future may conjure a cognitive judgment that the failure would be accompanied by disappointment; this anticipated emotion may then trigger actual experienced feelings of disappointment, or anticipatory disappointment. The cognitions of anticipated disappointment may be informed by past experience with failing a test. Similarly, imagining that one has been diagnosed with advanced cancer may conjure a cognitive judgment of anticipated regret of not being screened for cancer sooner; this anticipated regret may or may not trigger actual experienced emotions. In this way, past emotions may be used as a heuristic decision-making tool that informs perceptions of anticipated emotions, and indirectly, anticipatory emotions.

Interactions of Emotion and Reason in Decision-Making

The influence of emotion on judgment and decision-making is important because, as discussed in the next section, affective cognitive reactions are often more rapid than rational cognitive reactions (e.g., LeDoux 1996; Zajonc 1980). These affective cognitive reactions can differ from rational cognitive reactions in a variety of complex ways (e.g., Ness and Klaas 1994; Lipkus et al. 2005; Loewenstein et al. 2001). These divergences are often resolved when the emotional reactions exert a dominant influence on judgment (e.g., Berridge and Aldridge 2008; Lawton et al. 2009; Norton et al. 2005). Additionally, rational cognitive and affective cognitive reactions can interact and influence each other in a variety of ways (Finucane et al. 2003), such as when anticipated emotions influence anticipatory emotions, as described above. Importantly, rational cognitive conceptualizations do not always influence affective reactions as might be expected. For example, affective reactions to risky consequences are largely unaffected by changes in the probability of those consequences, particularly when the consequences are affectively laden (e.g., Rottenstreich and Hsee 2001).

Recent research has demonstrated that emotion and cognition interact in important and interesting ways, influencing behavior in a manner that is not always anticipated. For example, preliminary longitudinal research has demonstrated that, among individuals who worry about cancer, risk perceptions actually have a *negative* relationship with cancer-preventive behaviors such as quitting smoking (e.g., Klein et al. 2009). Additionally, emotion can interact with framing of risk messages to affect behavioral outcomes. For example, enthusiasm and anger may temper the relationship between framing risk information in terms of gains and risk-aversion, whereas distress may increase this relationship (Druckman and McDermott 2008). That is, among individuals experiencing either enthusiasm or anger, gain-framed messages elicited less risk aversion, whereas among individuals experiencing distress, gain-framed messages elicited more risk aversion. These effects held for both naturally experienced and experimentally induced emotion.

Experienced emotions, both anticipatory and incidental, have important influences on the processing of risk information and on decisions made under risky circumstances. For example, fear tends to promote risk aversion, while anger and happiness tend to promote risk-seeking behavior (e.g., Fischhoff et al. 2005; Johnson and Tversky 1983; Lerner and Keltner 2001; Raghunathan and Pham 1999). It has been argued that individual differences in risk-taking preferences are influenced by tendencies of those individuals' emotional reactions to risky options (Hsee and Weber 1997), which is interesting in light of the fact that there are reliable individual differences in reliance on experiential thinking and affective reactivity (Gasper and Clore 1998; Peters and Slovic 2000). Recent research indicates that risk information may be processed through more affective-cognitive, as opposed to analytic-cognitive, pathways (e.g., Loewenstein et al. 2001; Slovic et al. 2004; Weinstein 1989; Weinstein et al. 2007). Further, affective variables such as feeling of dread may influence public acceptance of risk (e.g., Alhakami and Slovic 1994; Fischhoff et al. 1978; Slovic 1987), or may infuse risk information with meaning (Slovic et al. 2004).

Additionally, emotions affect the way that any information is processed and recalled. For example, positive moods facilitate more heuristic thinking, whereas certain negative moods, such as sadness, facilitate more systematic thinking (e.g., Bless 2000; Clore et al. 2002; Fiedler 2000). Individuals also attend more carefully to mood-congruent information,

and are more likely to recall such information when they are in a mood-congruent state (Bower 1991). This highlights the potential for affect to direct individuals' attention to different risk-related information (Diefenbach et al. 2008), orient individuals in the presence of information (Finucane et al. 2003), and act as a perceptual lens for interpreting situations (Lerner et al. 2003).

In light of the evidence presented above, it follows that risk messages should address affective reactions directly, rather than simply attempting to intervene on cognitive reactions.

Current Research

Affective Versus Rational Modes of Cognition

One of the most widely accepted aspects of the new look in emotion and decision-making is the notion that reason and emotion involve different kinds of cognitive processing, or different sorts of knowledge of events. These differences can be approached in two ways: first in terms of levels of cognitive processing from initial perception/appraisal to higher-order understanding, attribution, and perspective-taking; and second in terms of holistic-syncretic versus sequential-analytic styles of cognitive processing. In both cases, the cognitive process in question can be related to specifiable and observable or potentially observable brain mechanisms. Levels of cognitive processing can be related to levels in the hierarchy of neurochemical systems in the brain that respond to events, and styles of cognitive processing can be related to right- versus left-sided mechanisms in the brain.

Levels of Cognitive Processing in Judgment

Initial appraisal. The process whereby the personal relevance of an event is apprehended for good or ill has been termed *appraisal*. Magda Arnold (1960a, b) saw appraisal to be instinctive and immediate: "even before we can identify something we may like or dislike it. . . There seems to be an appraisal of the sensation itself, before the object is identified and appraised" (1960b, p. 36). She suggested that appraisal is based upon a multilevel *estimative system*, the most fundamental of which she termed the *subcortical estimative system*. Arnold's conceptualization of appraisal accords well with recent evidence on emotional factors in decision-making. However, although her notion has been highly influential and adopted in a general way, most came to see appraisal as a relatively complex higher-order cognitive process.

Analytic-cognitive appraisal. Appraisal was defined by Richard S. Lazarus as *the evaluation of the harmful or beneficial significance of some event*. He and his colleagues demonstrated that the apparent harmfulness or stressfulness of the same stimulus event may be manipulated by manipulating appraisal. Spiesman et al. (1964) showed that a gruesome film depicting an apparently painful circumcision-like ritual in an aboriginal tribe caused strong physiological arousal. However, arousal was lessened by sound tracks which promoted *intellectualization* (describing the scene dispassionately and technically from an anthropological point of view) or *denial* (telling subjects that the ritual, while painful at points, was part of a happy celebration on the occasion of coming into manhood). Moreover, Lazarus and Alfert (1964) demonstrated

that the stress could be cognitively “short-circuited” by giving the denial information beforehand: This condition produced significantly less physiological arousal in viewers than the denial commentary accompanying the film.

In this model, events are first evaluated by a cognitive process termed *primary appraisal*. Information about the circumcision ritual being actually a joyful occasion presumably altered the primary appraisal of subjects to the film. If positive or negative emotions are aroused, coping strategies are selected to deal with the event in a cognitive process termed *secondary appraisal*. Some coping strategies are *emotion-focused*, attempting to reduce distressing emotion or increase positive emotion sometimes by defense mechanisms such as denial and intellectualization. Other coping strategies are *problem-focused*, doing something actively to change the situation for the better.

A major point of contention relating to Lazarus’ analysis is whether appraisal can be instinctive and intuitive, as Arnold (1960) argued, or requires more complex cognitive processing. Lazarus was explicit that cognition is both necessary and sufficient for the occurrence of emotion: “*sufficient* means that thoughts are capable of producing emotions; *necessary* means that emotions cannot occur without some kind of thought” (1991b, p. 353. Italics in the original). However, a classic debate with Robert Zajonc provided evidence that emotions can signal goal relevance, rather than the reverse.

The Zajonc–Lazarus debate. Studies by Robert Zajonc and colleagues suggested that an individual could respond preferentially to stimuli without knowing what they were. Using ambiguous stimuli like nonsense syllables and oriental ideograms, they showed that mere exposure to these stimuli produced liking. Persons expressed more liking the more that they were exposed to the stimuli, even though they could not consciously recognize them as being more familiar (Kunst-Wilson and Zajonc 1980; Wilson 1979). On this and other evidence, Zajonc suggested that affect occurs prior to, and independently of, cognition (Zajonc 1980, 1984). This ignited a classic debate with Lazarus (1982a, b).

Examining the arguments advanced by Zajonc and Lazarus reveals that their disagreement rests upon what each defines as “cognition.” Lazarus acknowledged that the comprehension that one’s well-being was at stake could be a “primitive evaluative perception” that may be “global and spherical.” In contrast, Zajonc required that cognition involve some kind of transformation of sensory input – some kind of “mental work” – and he complained that “Lazarus has broadened the definition of cognitive appraisal to include even the most primitive forms of sensory excitation” (1984, p. 117). Thus, Zajonc and Lazarus agreed that some sort of sensory information is required for emotion, but they disagree about what would constitute “cognition.”

The LeDoux findings. Joseph LeDoux and his colleagues demonstrated that there is direct sensory input to the amygdala and that this input is necessary for the learning of conditioned fear responses (LeDoux 1994). The amygdalae play a crucial role in responding to emotional events and storing emotional memories, as demonstrated by the Kluver-Bucy syndrome, which appeared when the amygdalae were removed bilaterally in monkeys (Kluver and Bucy 1939). Affected animals lost emotional responding even to innately feared stimuli such as snakes and fire; the animal mouthed even distasteful and painful stimuli such as dirt, feces, rocks, and burning matches.

The classical auditory and visual pathways proceed from the cochlea to the auditory neocortex, and retina to the visual neocortex, respectively. LeDoux and colleagues discovered pathways in the auditory and visual systems that diverge and proceed directly to the amygdalae (LeDoux et al. 1984). Therefore, the amygdalae have their own subcortical sensory inputs.

These inputs appear to constitute evolutionarily primitive early warning systems that trigger fast responses to threatening stimuli essential in the quick “assignment of affective significance to sensory events” (LeDoux 1993, p. 110). LeDoux termed this fast but relatively undifferentiated response to events the “low road” to cognition. The amygdala inputs are several synapses shorter than those of the classical sensory systems and therefore offer “a temporal processing advantage at the expense of perceptual completeness” (p. 112). Microseconds after the initial sensory input is received, more completely processed input enters the amygdalae from the neocortex and other centers associated with higher-order cognition, so that we are able to consciously “know” what caused the emotional reaction: This slower but more differentiated process LeDoux termed the “high road” to cognition.

LeDoux’s research speaks to the fundamental issue of the nature of the brain’s initial response to events. It appears that low road emotional responding precedes and can guide high-road cognition. Moreover, stimulation, lesions, and chemical manipulations (e.g., by drugs) of the central nervous system can lead to apparently complete emotional experiences and goal-directed behavior with no high-level cognitive “reason” for the state. This is the case despite the fact that the responder may recognize that the feelings are inappropriate and be striving unsuccessfully to control them.

The LeDoux studies had an important influence on the Zajonc–Lazarus debate, for they demonstrated that the subcortical amygdalae receive basic information about sensory events before the neocortex. In response, Lazarus (1991a) accepted that there are in fact two levels of cognitive processing: one direct and immediate, the other involving information processing. Lazarus acknowledged what he termed an “automatic mode of meaning generation” (1991a, p. 155). He suggested that there are two sorts of appraisal: one rapid, “automatic, involuntary, and unconscious”; the other “time-consuming, deliberate, volitional, and conscious” (Lazarus 1991a, p. 188).

Appraisal and the frontal cortex. The notion that there are multiple levels of cognition can be related directly to different processing and memory systems in the brain, and indeed it accords well with Magda Arnold’s (1960a, b) notion of multilevel “estimative systems.” LeDoux (1994) and Panksepp (1994) distinguished levels of cognition based upon brain mechanisms: “cortico-cognitive” processes are based on the neocortex and hippocampus, and “emotional” processing involves the amygdalae.

A neocortical region involved in the processing of the incentive value of events that receives strong inputs from the amygdalae is the orbitofrontal cortex (OFC), in the front of the brain immediately above the eyes. It has long been known that damage to the prefrontal cortex (PFC) in general and the OFC in particular produces serious deficits in decision-making, emotional processing, and social skills, which may be attributable to an overall insensitivity to future consequences. Damasio and colleagues have suggested that the key to the impairment in patients with OFC damage is their inability to generate normal somatic responses to emotionally charged events. Damasio’s (1994) Somatic Marker Hypothesis states that the positive or negative incentive values associated with appraisal and decision-making are stored as somatic markers in the ventromedial prefrontal cortex (VMPFC), which includes the OFC. Activation of these markers produces bodily feelings that in turn contribute to decision-making. On the other hand, Rolls (1999) suggested that requiring involvement of peripheral somatic processes is unnecessary, and that brain activity in the OFC and amygdalae, and brain structures connected with them, is related to felt emotion directly. Others suggest that the influence of emotion extends beyond valence, or positive–negative reactions, and that specific

emotions – happiness, security, fear, anger, guilt, sex, love, pride, pity, nurturance, resentment, and others – can have specific effects upon judgment and decision-making. We shall return to this issue later in the chapter.

Brain Lateralization and Style of Cognitive Processing in Judgment

Multiple levels of knowledge and decision-making, from basic sensory awareness to higher-order rational cognitive processing, are clearly related to a hierarchy of neurochemical systems objectively visible in brain anatomy. Another concrete aspect of brain anatomy with implications for decision-making is cerebral lateralization. The left and right hemispheres of the brain are different in many respects – in embryological origin, in microstructure, and in gross anatomy – and these differences have functional implications. Most obviously, the left hemisphere (LH) is associated with language in the vast majority of human beings. The functions of the right hemisphere (RH) are less well understood but are the subject of intensive current research.

Lateralization of function appears in vertebrates including fish, reptiles, birds, and mammals (Denenberg 1981, 1984). Species with eyes placed laterally tend to scan for predators with the left eye, indicating RH involvement; while conspecific vocalizations tend to be processed in the LH (Des Roches et al. 2008). In most humans, language is processed in the LH, with Broca's area in the anterior LH associated with language expression and Wernicke's area in the posterior LH associated with language comprehension. Indeed, the human brain is more lateralized than most other vertebrate brains because the size of the corpus callosum, which connects the left and right neocortices, increases greatly during evolution, while the size of the anterior commissure, which connects left and right paleocortical and subcortical regions, does not. For this reason, many paleocortical and subcortical regions of the human brain are more directly connected with the ipsilateral neocortex than they are with corresponding paleocortical and subcortical regions on the other side (Ross 1992).

Holistic-syncretic versus sequential-analytic styles of cognitive processing. Tucker (1981) summarized evidence that the LH and RH are associated with different styles of conceptualization. The RH is characterized by an ability to holistically integrate and synthesize analog information from a variety of sources into a form of nonverbal conceptualization termed *syncretic cognition*. In syncretic cognition, sensory, affective, and cognitive elements are fused into a global construct. Syncretic ideation is particularly suited to picking up the affective meaning of complexes of nonverbal information provided by facial expression and gesture, vocal prosody and tone, and body movement and posture. In contrast, the LH is associated with *analytic cognition*, which is characterized by linear and sequential cognitive operations that can logically and rationally differentiate and articulate concepts. Language provides a prime example of analytic cognition. The global, holistic, and nonverbal knowledge of the RH is compatible with emotional cognition, while the verbal, linear, and sequential knowledge of the LH is compatible with rational cognition.

Brain lateralization and emotion. There are two major theories of the brain lateralization of emotion. The right hemisphere hypothesis states that the RH is specialized for all emotion processing (Borod et al. 1998), while the valence hypothesis holds that the RH is specialized for negative and the LH for positive emotion (Ahern and Schwartz 1979; Bogen 1985; Davidson 1992). A variant of the valence hypothesis was proposed suggesting that the RH is specialized

for avoidance emotions and the LH for approach emotions (Davidson and Irwin 1999). This answered evidence of LH involvement in emotions such as anger, which although considered to be hedonically negative is considered an approach emotion (Harmon-Jones et al. 2010).

Examination of the literature reveals that the right hemisphere hypothesis appears to be correct for emotional *communication*, both expression and recognition aspects (Borod and Koff 1990; Borod et al. 1986; Etcoff 1989; Ross 1981, 1992; Silberman and Weingartner 1986; Strauss 1986). There is much evidence that systems in the anterior and posterior RH are involved in the display and recognition of emotion, respectively. Buck and Van Lear (2002) suggested that these play roles in *spontaneous emotional communication* that are analogous to roles Broca's and Wernicke's areas in the LH play in the expression and comprehension of intentional symbolic messages, notably language.

The valence hypothesis may be more relevant to the question of the brain loci of emotional *experience*. Despite considerable evidence favoring the valence hypothesis, there are data that are difficult to reconcile. For example, although the theory holds that the LH is involved in positively valenced emotion, there is evidence that disgust is represented in the left insula (Calder 2003; Calder et al. 2000; Straube et al. 2010). This may be compatible with the approach-avoidance version of the valence hypothesis as, like anger, disgust albeit hedonically negative has been described as an approach emotion, and indeed a prosocial emotion, as a common response to disgust is to invite others to experience the disgusting object for themselves (Rozin et al. 1993). On the other hand, evidence that orgasm is based in RH mechanisms (Janszky et al. 2002; Holstege et al. 2003) seems difficult for both the valence and approach-avoidance theory accounts. Ross, Homan, and Buck (1994) suggested an alternate to the valence hypothesis that may answer some of the problems of the original conceptualization. This was based upon a study of patients undergoing the Wada test, where a brain hemisphere is temporarily deactivated by sodium amobarbital in preparation for brain surgery. Before the operation, patients were asked to describe a life event they had experienced that gave rise to strong emotion. During the Wada test while the RH was deactivated, they were asked about the same event. After the operation, they again described the event. Although the RH inactivation did not change the factual content of the life event, eight of the ten patients showed evidence of minimizing or denying primary emotions such as fear or anger. In a few cases, the RH inactivation seemed to produce a change in emotion. A man who described himself as "angry and frustrated" at the inability of physicians to diagnose his condition described himself as "sorry for people that they had so much trouble finding out what was wrong" when the RH was inactivated. A woman who said that she was "mad and angry" at being teased for her epilepsy as a child, when the RH was inactivated stated that she was "embarrassed" at the abuse. When the RH functioning was restored, the patients denied being sorry or embarrassed and insisted that they had been angry.

Ross et al. (1994) suggested that the RH inactivation produced changes consistent with a change in *type* of emotion in addition to valence: specifically a change from selfish to prosocial emotion (Buck 2002). This was consistent with an observation by Buck and Duffy (1980) in LH and RH damaged patients in responding to emotionally loaded slides, which suggested that the RH might be associated with the spontaneous expression of emotion, while the LH is associated with learned display rules: expectations about how and when emotions should be expressed. Specifically, most patient groups accentuated positive displays and attenuated negative displays, as would be expected from display rules, while LH-damaged patients did not.

The Ross et al. (1994) results suggested an extension of this: that the RH is associated with basic emotions, both negative and positive (e.g., the right-lateralization of orgasm), while the LH is associated with social emotions, including the voluntary modulation of RH-mediated basic emotions via display rules (pseudospontaneous communication: Buck and Van Lear 2002). Indeed, social emotions may often appear to be positively valenced because display rules often (but not always) encourage the expression of cheerful and positive albeit perfidious displays that are at variance with the “true feelings” of the responder. For example, Davidson and Fox (1982) demonstrated that social smiling is associated with LH activation in human infants, and interpreted this as consistent with the association of the LH with positively valenced emotions. However, another explanation is that the infants’ social smiles reflect prosocial attachment emotions as opposed to “selfish” pleasure. Indeed, stimuli used to elicit positive emotion may often elicit prosocial emotions as well (e.g., pictures of cute children, a baby gorilla). Unfortunately, stimuli used in these studies sometimes are not sufficiently described to judge whether the positive slides are actually prosocial in nature (e.g., Balconi et al. 2009).

Another consideration relevant to the Ross et al. (1994) hypothesis is that the LH is clearly associated with language, so that linguistically learned and structured display rules may be associated with LH responding regardless of the nature of the emotion being controlled. Moreover, language itself is not necessarily unemotional. Human beings derive pleasure when language is used well and frustration when it is misused, and it makes sense that such “linguistic emotions” are associated both with sociality and with LH processing (Buck 1988, 1994). There are known to be significant connections between Wernicke’s area in the LH and underlying limbic system structures, which exist most clearly in human beings (LeDoux 1986) and this could be a mechanism by which emotional factors are involved directly in language.

While relatively few studies have directly evaluated the Buck and Duffy (1980) and Ross et al. (1994) hypothesis, Shamay-Tsoory et al. (2008) found support in two studies. In the first, they tested the ability of patients with lesions in left versus right PFC to recognize photographs of six basic emotions (happy, sad, afraid, angry, surprised, disgusted from Ekman and Friesen 1975) and seven complex social emotions (interested, worried, confident, fantasizing, preoccupied, friendly, suspicious from Baron-Cohen et al. 1997). Shamay-Tsoory et al. found that left PFC-damaged patients were significantly more impaired in recognizing complex social emotions, and right PFC-damaged patients were slightly albeit not significantly more impaired in recognizing basic emotions. In the second study, they showed pictures of eyes posing basic versus complex social emotions to normal persons in left or right visual field presentations. This found the RH to be significantly better at recognizing basic than complex social emotions, and the LH to be slightly more accurate in recognizing complex social emotions than basic emotions. Shamay-Tsoory et al. (2008) concluded, consistent with Ross et al. (1994), that there is a RH advantage in recognizing basic emotions and an LH advantage in recognizing complex social emotions. The findings of Prodan et al. (2001) are also consistent: They showed that upper facial displays which are more likely to reflect basic emotions are processed in the RH, while lower face displays which more likely reflect the moderating effects of display rules are processed in the LH.

Another study relevant to the lateralization of basic versus social emotions was conducted by Gur and colleagues (Gur et al. 1995), who studied resting metabolism in brain areas associated with emotion. Among other things, results indicated that metabolism was left-lateralized in the cingulate gyrus, and right-lateralized in most ventro-medial temporal

lobe regions of the limbic system and their projections in the basal ganglia. As the amygdalae in the temporal-limbic region are associated with self-preservation, while the cingulate is associated with species preservation in MacLean's (1993) analysis, the pattern of greater relative left-sided cingulate metabolism and greater relative right-sided temporal limbic system metabolism accords well with the Ross et al. (1994) suggestion that selfish emotions are right-lateralized and prosocial emotions left-lateralized.

In conclusion, the evidence regarding the nature of the differences between the LH and RH in emotion is suggestive but not definitive, but attention should be paid to the selfish versus prosocial nature of stimuli as well as their valence and approach/avoidance implications. Studies of the lateralization of the amygdalae and PFC may shed further light on this issue.

Lateralization of the amygdalae. There is evidence that the amygdalae are asymmetrical, both structurally (Szabo et al. 2001) and functionally (Baas et al. 2004; Phelps et al. 2001; Schneider et al. 1997). We saw that LeDoux and colleagues showed the amygdalae to be necessary in the conditioned fear response. Subsequent research suggested that the right and left amygdalae are differentially involved in fear. Coleman-Mesches and colleagues found that temporary inactivation of the right, but not the left, amygdala by drug microinjection disrupted the retention of passive avoidance responding in rats (Coleman-Mesches and McGaugh 1995a, b, c), and that inactivation of the right but not the left amygdala attenuated the response to a reduction in reward (Coleman-Mesches et al. 1996). Also, lesions to the right amygdala led to larger reductions in fear responses than lesions to the left amygdala (Baker and Kim 2004). In humans, right temporal lobectomies led to lessened ability to recall unpleasant emotional events, while left temporal lobectomies did not (Buchnan et al. 2006). These results suggest that the right amygdala may make a greater contribution than the left to the memory for aversive experience. Also, Smith et al. (2008) described a case of post-traumatic stress disorder (PTSD) in a patient with no left amygdala, and suggested that because PTSD survived in the absence of the left amygdala, the right amygdala normally plays a greater role in its symptoms: fear conditioning, modulating arousal and vigilance, and maintaining memory for emotional context.

The functions of the left amygdala are not well understood but are the subject of much recent interest on the part of researchers. In a meta-analysis, Baas et al. (2004) found that, in studies of emotional processing, the left amygdala is more often activated than the right, and it appears to be activated by positive as well as negative emotion. Hardee et al. (2008) demonstrated that the left more than the right amygdala discriminated between increases in eye white area that signaled fear versus a similar increase in white eye area associated with a lateral shift in gaze direction, suggesting that parallel mechanisms code for emotional face information. This result is consistent with suggestion by Markowitsch (1998) that the left amygdala encodes emotional information with a relatively greater affinity to detailed feature extraction and language, while the right amygdala responds to pictorial or image-related emotional information in a relatively fast, shallow, or gross response. This analysis is consistent with the syncretic cognition-RH versus analytic cognition-LH distinction considered previously (Tucker 1981).

There are suggestions that the left amygdala is involved in the functioning of a "social brain" whose functioning is compromised in Asperger Syndrome (AS), a core feature of which is impaired social and emotional cognition. Fine et al. (2001) reported a case study of a patient with early left amygdala damage who was diagnosed with AS in adulthood. This patient had severe impairment in the ability to represent mental states (theory of mind, or ToM) in line with the AS diagnoses, but showed no indication of executive function impairment, suggesting both a dissociation between ToM and executive functioning, and that the left amygdala may play

a role in the development of circuitry mediating ToM. Ashwin et al. (2007) found that an AS group showed relatively less activation to fearful faces in the left amygdala and left OFC compared to controls. In contrast, left amygdala hyperactivation in response to emotional faces has been found in Borderline Personality Disorder (BPD: Donegan et al. 2003; Koenigsberg et al. 2009). The contrast between the symptoms of AS versus BPD and left amygdala hypoactivation and hyperactivation may therefore be relevant to understanding the unique functions of the left amygdala.

Both AS and BPD are associated with disrupted interpersonal relations, but for markedly different reasons. AS differs from autistic disorder in that there are no clinically significant delays in language, cognitive development, curiosity, or adaptive behavior other than in social interaction. Major AS symptoms include impairment of social interaction and communication, including deficits in the use of nonverbal behaviors to regulate social interaction (e.g., eye-to-eye gaze, facial expression). There is a typical lack of empathy (awareness of others or their needs), a lack of social or emotional reciprocity, and a preference for solitary activities (American Psychiatric Association 1994). In short, AS (and left amygdala hypoactivation) is associated with something of an obliviousness to other persons.

The pattern of social behavior in BPD is in many respects opposite. Major symptoms of BPD include impulsivity and emotional instability which can involve episodes of intense dysphoria, irritability, anxiety, and inappropriate anger that is difficult to control (American Psychiatric Association 1994). The individual may make frantic efforts to avoid real or imagined separation, rejection, or abandonment; which can lead to unstable and intense interpersonal relationships that alternate between extremes of idealization and devaluation. This pattern of dysregulation may result from a kind of social and emotional hypervigilance (Donegan et al. 2003), which speculatively could be related to left amygdala hyperactivation.

Lateralization of the prefrontal cortex. We can continue to consider these issues as we turn to neocortical systems closely connected with the amygdala: the right- and left-sided prefrontal neocortex (PFC) and their subregions. We noted the importance of the PFC in decision-making, particularly, the VMPFC and OFC subregions of the PFC. There is evidence that, like the amygdala, the functions of the PFC are lateralized: We have seen that the amygdala is closely connected with the OFC, and that persons with AS showed relatively less activation to fearful faces in both the left amygdala and left OFC (Ashwin et al. 2007).

Shamay-Tsoory et al. (2008) noted that the Buck and Duffy (1980) analysis implies that, to develop display rules, the child has attained explicit theory of mind (ToM) skills to attribute mental states to others. Also, while emotion recognition has been associated with the right PFC, recognition tasks involving ToM skills are associated with the left PFC. From this, Shamay-Tsoory et al. suggested that the right PFC plays a role in mediating basic emotions and the left PFC has a unique role in complex social emotions.

Sex differences in brain lateralization. So, does the left amygdala function with the left PFC along a social-emotional obliviousness to hypervigilance dimension, with normal social behavior and emotional communication requiring a moderate level of functioning? Normal women and men are sometimes said to vary along something of a vigilance-to-obliviousness dimension when it comes to social and emotional communication, so it is of interest that there is evidence of sex differences in amygdala and PFC lateralization. Killgore et al. (2000) hypothesized a redistribution of cerebral functions from the amygdala to the PFC from childhood to adolescence, reflecting greater self-control over emotional behavior. They found that, with increasing age, females showed an increase in PFC relative to amygdala activation in the left hemisphere in

response to fearful faces, whereas males did not show a significant age-related change. (Killgore and Yurgelun-Todd 2001) found both sexes to have greater left amygdala activation in response to fearful faces, while happy faces produced greater right than left amygdala activation in males but not females. Moreover, in women, activity in the left, but not right amygdala has been found to predict subsequent memory for emotional stimuli while right amygdala activity predicts emotional memory in men (Cahill et al. 2004). Cahill (2005) suggested that, in processing emotional experiences, women generally use the left and men the right amygdala, which among other things helps women remember details and men the central ideas of events.

In conclusion, there appears to be considerable evidence that the selfish-prosocial hypothesis is a viable alternative to valence and approach/avoidance hypotheses of cerebral lateralization. Neither the valence hypothesis nor the approach-avoidance analysis seems compatible with the observed sex differences, or the evidence that AS and BPD relate respectively to left (but not right) amygdala hypo- and hyperactivation, or the right-lateralization of orgasm. The selfish-prosocial hypothesis is compatible with these observations and also allows them to be placed in a wider context of the neurochemical basis of socio-emotional functioning including basic sex differences that are explainable in terms of evolutionary theory, with women being more empathic and verbal in accord with their greater caregiving role.

Valence Versus Discrete Emotion Approaches

Valence Approaches

Valence approaches assume that the effects of emotion on decision-making involve a dimension of positivity-negativity, with positive emotions having similar influences on behavior generally opposed to the influences of negative emotions (Elster 1998). One application of the valence approach is Forgas's Affect Infusion Model (AIM), which posits that positive or negative affective states or moods have a persistent influence on judgment and decision-making by influencing the kinds of information people attend to, interpret, and recall (Forgas 1995), as well as attitudes, values, and judgments (Forgas 1999) and attributions for behavior (Forgas et al. 1990). For example, research in this line indicates that those in good moods make optimistic judgments, and those in bad moods make pessimistic judgments (e.g., Schwarz and Clore 1983). Also, positive emotions encourage the use of heuristics or mental shortcuts, while negative emotions encourage more complex cognitive processing (Schwarz 2002).

As noted previously, the somatic marker hypothesis also states that decision-making is guided by emotions (Damasio 1994). This hypothesis is supported by the research that demonstrates that patients with neural abnormalities in areas that govern emotions and feelings demonstrate abnormalities in these emotion and feelings, which in turn results in severe impairment of judgment and decision-making (e.g., Bechara et al. 2000, 2001; Bechara 2004). For example, individuals who have damage in the VMPFC, which as we have seen is an area involved in anticipatory emotional responses to decisions, are unable to feel anticipatory negative emotions associated with a risky gambling decision; thus, these individuals are unable to adapt to a decision-making task that requires them to learn to choose from less risky decks during the gambling process (Bechara et al. 1997). Emotions are thus seen as essential tools that aid in "rational" decision-making, and individuals who are unable to feel normal emotions are thus incapable of making good decisions.

Discrete Emotion Approaches

More recent research has focused on the role of specific emotions in judgment and decision-making. In contrast to valence theorists, these researchers posit that different emotions can have different influences on behavior, regardless of whether they are the same valence. One such theory, the Appraisal Tendency Framework, divides emotions on a series of appraisals, including valence, but also other appraisals such as approach-avoidance (Han et al. 2007; Lerner and Keltner 2000). Research in this line has demonstrated that anger and fear, both negatively valenced emotions, have opposite influences on risk processing, such that anger causes individuals to be risk-seeking, whereas fear causes individuals to be risk-averse (Lerner and Keltner 2001).

Evolutionary theory: Another discrete emotion approach to persuasion and decision-making involves evolutionary theory. This approach suggests that affective stimuli can arouse specific emotions which motivate thoughts and actions consistent with the evolutionary functions of the emotion in question (Keltner et al. 2006). The evolutionary approach predicts that the effectiveness of an emotional appeal will depend upon the fit between the particular emotion and the context: A particular emotional appeal may be effective in one context and ineffective or counter-effective in another.

As an example, Griskevicius and colleagues (2009) showed that two emotions with clear evolutionary functions – fear and romantic desire – have different effects when combined with two different persuasive tactics from Cialdini and Goldstein (2004). One tactic used the principle of social proof: that if many others are doing it, it must be good; the second used the principle of scarcity: if it is rare, it must be good. Social proof (#1 product in the country!) was effective following the fear appeal but not the romantic desire appeal, while in contrast the scarcity appeal (limited time offer!) was effective when combined with romantic desire, but backfired when combined with fear. With additional analyses, the results suggested that fear motivated participants to stick together, while romantic desire motivated independence. The authors concluded that discrete emotions serve qualitatively distinct functions that cannot be captured by affective valence alone, and that these functions must be considered in judging the effectiveness of emotional appeals (Griskevicius et al. 2010).



Affective neuroscience. A different approach, complementary to evolutionary theory, relates discrete emotions to specific neurochemical systems in the brain (Buck 1999). Paul D. MacLean (1993) was the originator of the Triune Theory of the brain and the limbic system concept, and a pioneer in the study of brain mechanisms of emotion. He suggested that there are three levels of processing systems in the brain: non-cortical (non-layered) *reptilian* systems characteristic of the brains of reptiles, old mammalian systems with 3–5 cortical layers (limbic system) characteristic of primitive mammals, and new mammalian systems with 6 layers (neocortex) characteristic of advanced animals including human beings. In addition, MacLean distinguished two general sorts of emotion at the level of the limbic system: some functioning in the survival of the individual and others functioning in the survival of the species. In his view, more complex species carry the older processing systems, which can influence and even unconsciously set the basic agenda for the newer systems.

Based upon MacLean's analysis, we suggest that there are in human beings *Reptilian* emotions involving "raw" sex and aggression (sex and power) based upon subcortical parts of the brain. Paleocortical (limbic system) areas are associated with more complex

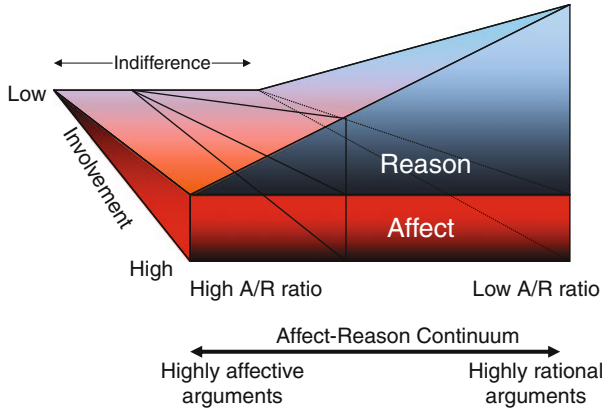
motivational-emotional systems. *Individualist* or selfish emotions involve self-preservation, and can be positive (happiness, satisfaction, security) and negative (anger, fear, sadness, disgust). *Prosocial* emotions involve species preservation, and can be positive (attachment, affiliation, love) and negative (isolation, loneliness, guilt, shame). There are also *Cognitive* emotions involved in the structuring of the cognitive system (curiosity, surprise, interest, boredom: Buck 1999). These specific emotions – reptilian, positive prosocial, negative prosocial, positive individualist, and negative individualist, are assessed by the Communication via Analytic and Syncretic Cognition (CASC) scale, which has been adapted to studies of the role of emotion versus reason in persuasion and social influence (Buck et al. 2004).

The affect-reason-involvement (ARI) model. A central assumption of this approach is that persuasion involves an interaction of affective and rational cognition, and this implies that involvement can be both rational and affective. Scales developed to measure involvement commonly include items appearing to assess both rational and affective involvement. For example, the McQuarrie and Munson (1987) revision of the Personal Involvement Inventory (RPI) includes items assessing both “risk” (no risk vs risky; easy to go wrong vs hard to go wrong; hard to pick vs easy to choose) and “hedonism” (appealing vs unappealing; unexciting vs exciting; fun vs not fun).

Chaudhuri and Buck (1995) defined *involvement* after Batra and Ray (1983) as the “depth and quality of cognitive processing” (p. 109), and invoked Tucker’s (1981) notion of syncretic versus analytic cognition to argue for two corresponding types of involvement. The tendency of a medium to encourage deep and high quality analytic processing defines its *rational involvement*, while its tendency to encourage deep and high quality syncretic processing defines its *emotional involvement* (Chaudhuri and Buck 1995; pp. 109–110. Italics in the original). Results of studies rating rational-analytic and affective-syncretic responses to 240 magazine and television advertising messages showed that, with a wide variety of product category and advertising strategy variables controlled, print media produced higher analytic-cognitive responses and electronic media higher syncretic-cognitive responses.

The differentiation of analytic and syncretic cognition blurs the common distinction between emotion and cognition: affect becomes a *type of cognition*, a type of knowledge, as we have seen. More specifically, affect involves syncretic cognition (feelings and desires), and reason involves analytic cognition, as defined previously (Tucker 1981). While affect and reason are often considered to be at ends of a continuum, we consider them to be qualitatively different kinds of systems that interact with one another (Buck 1985, 1988). The relationship between affect and reason is illustrated in  Fig. 27.1. The continuum at the base of  describes the mix of affect and reason: the affect/reason continuum (A/R Continuum). On the extreme left of the continuum, the influence of affect is total: Reason has no influence. As one goes to the right, reason exerts an increasing influence relative to affect, although the influence of affect never falls to zero.

As noted, *involvement* is defined conceptually as the depth and quality of cognitive processing, and both affective and rational involvement are possible. Given this conceptualization, *Level of Involvement (LI)* can be defined operationally as the average of affective and rational involvement: that is: $LI = (A + R)/2$. In this way, involvement is defined both conceptually and operationally as a combination of affective and rational cognitive processing: If cognitive processing is measured, involvement is measured by definition. This suggests that one can be “hot, cold, or indifferent” in response to attitude objects and messages: “hot



■ Fig. 27.1

The affect-reason-involvement solid. Reason and affect interact on the face of the figure with reason having no influence on the left (high A/R ratio) and an increasing influence to the right (low A/R ratio). Involvement varies from a maximum on the face of the figure to low involvement (indifference) at the rear. An “ARI slice” is shown at the point where the influence of affect and reason are equal (Modified with kind permission from Fig. 2 in Buck et al. [2004])

processing” is relatively high in affect (high A/R Ratio) and high in involvement; “cold processing” is relatively high in reason (low A/R Ratio) and high in involvement; “indifference” is low in both affect and reason, and low in involvement.

The *ARI Solid* presented in Fig. 27.1 models the relationships between affect, reason, and involvement. This is a three-dimensional figure bounded on one side by the A/R continuum and on the other by a low-high LI dimension. The relative influence of affect and reason at any point on the A/R continuum is represented by an *ARI Slice* in which the relative influence of affect and reason remains constant as involvement varies. The “floor” of the ARI solid is a two-dimensional space with the involvement dimension on the Y-axis and the A/R ratio on the X-axis (Buck et al. 2004). The position of an object (e.g., product or message) as represented by LI and the A/R ratio can be mapped on this surface, producing a Reason-Affect Map (RAM). For example, cars are rated high on both affect and reason: They are therefore in the middle of the A/R continuum and high in LI. Insurance is rated low on both affect and high on reason: It therefore is low on the A/R continuum and moderate in LI. Candy is rated high on affect and low on reason: It is therefore high on the A/R continuum and moderate in LI. Paper products are rated low on both affect and reason: They are therefore in the middle of the A/R continuum and low in LI. Messages – persuasive arguments – can also be rated for affect and reason and placed on the floor of the ARI solid.

Operationalizing the interaction of discrete affects and reason. Discrete emotion approaches imply that the measurement of affect can be highly specific, involving for example discrete reptilian, individualist, prosocial, and cognitive emotions. For example, Kowta and Buck (1995) asked college students from India and the USA to assess the rational involvement with buying a number of consumer products using standard questions from the McQuarrie and Munson (1987) Revised Personal Involvement Inventory. The students were also asked

what emotions were associated with buying the same products. For each of five kinds of emotion (curiosity, prosocial, individualist, reptilian sex, reptilian power), A/R ratios were computed for each product. This allowed the computation of Reason-Affect Profiles (RAPs) showing the relative mix of reason and affect across the specific emotions. Illustrative results are presented in **Fig. 27.2**. For condoms, all emotions save curiosity were rated higher than reason, suggesting relatively high affective and low rational involvement across the board. For greeting cards, only prosocial emotions were rated higher than reason. For both headache medicine and insect repellent, individualist emotions were rated as important, perhaps because the individual was seeking relief from pain or insects. Power was also rated high for the insect repellent, perhaps because the individual was using the product to kill insects. Also, interestingly, there were few differences between Indian and American college students in their ratings.

The results of the Kowta and Buck (1995) study are suggestive, indicating that persons are aware that emotional factors are involved in their decisions and able to report on their influence. The proof of the pudding, as it were, is to attempt such measurement, and to investigate whether a greater understanding of the specific emotions involved in behavior, including risky behavior, can be used to design more successful intervention programs aimed at changing such behaviors.

Effective Public Health and Safety Appeals

Because emotion plays such a fundamental role in judgment and decision-making, risk communicators should pay attention to the affective content of their warnings and messages,

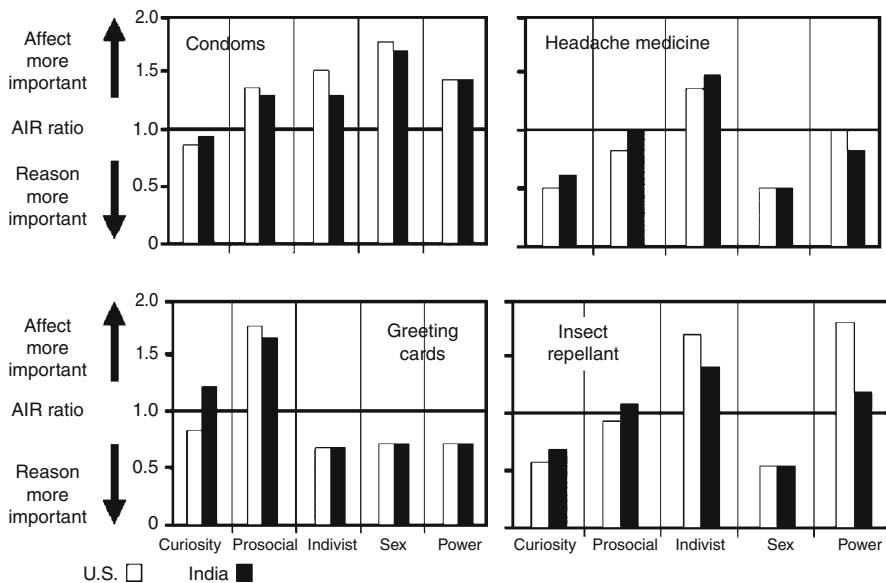


Fig. 27.2

Reason-affect profiles (RAPs) of four consumer products as rated by participants from America and India

and determine under what circumstances individuals are most likely to rely on their emotions to guide their decisions (Finucane 2008; Finucane et al. 2003), and what specific emotions are involved in such reliance. As stated, all communications, including public health and safety appeals, are infused with emotion, since all perceptions and messages contain an affective component (Hilton 2008; Zajonc 1980). Therefore, health and safety officials have an obligation and responsibility to the public to carefully attend to the emotional message they are presenting to the public and to design effective messages with emotion in mind. One of the essential aspects of such an enterprise is to understand the specific emotions involved in the behavior in question. A major example of risky behavior involving emotion is sex.

Uncovering Specific Emotional Influences: An Application to Safer Sexual Behavior

Exploring the role of emotions in specific risky behaviors and their relation to and interaction with social-cognitive constructs may have meaningful implications for designing more effective risk messages. Prior to the design and implementation of emotion-based warnings and risk messages, researchers must first gain a more comprehensive understanding of the dynamics of emotions that are involved in specific risky situations and decisions. For example, if anxiety about a health risk could be reliably linked to adoption of preventive behavior, officials could confidently address anxiety in risk messages with an expectation that these types of appeals would be effective in facilitating appropriate behavior change.

Emotions in sexual behavior: The SAFECOMM scale. In an effort to understand the experience and dynamics of emotions involved in potentially risky sexual situations, Buck et al. (2004) developed a version of the CASC scale termed the Safe Sex Communication Scale (SAFECOMM). Participants were asked how “people feel” in a variety of situations including discussing condom use with a potential partner and having sex with and without condoms in situations differing in intimacy (one-night stand, friend, committed relationship). It was expected that condom nonuse would be related to a variety of negative emotions but also some positive emotions involving reptilian sex and power (the “reptilian rewards” hypothesis). Also, it was expected that there would be sex differences in ratings of anger and power, with women relative to men reporting more power but less anger when condoms are used.

Results showed support for the expected pattern of positive and negative prosocial, positive and negative individualistic, and reptilian sex and power emotions; although angry and fearful negative individualistic emotions were distinguished. Main effects indicated that, overall, condom nonuse compared to use was associated with generally higher ratings on negative individualistic and prosocial emotions, and lower ratings of security and confidence.

Negative prosocial emotions (feeling ashamed, embarrassed, and guilty) showed an interesting pattern. When condoms were used, these emotions were at low levels across relationships, but when condoms were not used these emotions were at high levels in one-night stands, decreasing as the relationship became more exclusive. Negative prosocial emotions showed significant interactions between gender and condom use. Women reported higher levels of shame, embarrassment, and guilt relative to men when condoms were not used, and women reported relatively higher levels of shame and embarrassment than did men for less exclusive relationships.

Fearful individualistic emotions (feeling afraid, nervous, and uncomfortable) showed a pattern similar to those of the negative prosocial emotions. Women reported higher overall feelings of nervousness and discomfort, but not of fear. Fear showed a significant interaction between gender and condom use: Women reported less fear than men did when condoms were used, but more when condoms were not used.

Angry individualistic emotions (feeling angry, unsure, insulted, and selfish) showed a pattern generally similar to that of the negative prosocial emotions, with highly significant interactions with relationship exclusivity. When condoms were used, these emotions were at relatively low levels, but when condoms were not used, they showed high levels in one-night stands that decreased as the relationship became more exclusive. Again, there were significant interactions with condom use: Women relative to men reported higher levels of anger, and being unsure and insulted, when condoms were not used. Also, women reported relatively higher levels of anger and being unsure in the less exclusive relationships.

Positive individualistic emotions (feeling secure, confident, and satisfied) generally showed a mirror image of the pattern shown with negative prosocial emotions. Significant main effects indicated that security and confidence were stronger when condoms were used, but the main effect for satisfaction was not significant, and indeed there was a tendency in the opposite direction, due to males' greater reported satisfaction associated with condom nonuse. Significant interactions indicated that, when condoms were used, these emotions were at relatively high levels, but when condoms were not used, they showed low levels in one-night stands that increased as the relationship became more exclusive. Also, positive individualistic emotions showed significant interactions with gender. Relative to men, women reported relatively lower levels of confidence and satisfaction when condoms were not used, and women reported relatively lower levels of security and satisfaction in less exclusive relationships.

Positive prosocial emotions (feeling loving/loved, caring, and intimate) increased as relationships became more exclusive. Interestingly, and importantly, in both sexes condom nonuse was associated with *lower ratings of caring but higher ratings of intimacy*. In the less exclusive relationships, these emotions were at roughly equivalent levels whether condoms were used or not used, but in the long-term relationship these emotions were consistently higher, for both sexes, when condoms were not used. Positive prosocial emotions showed no significant interactions between gender and condom use: Both for females and males, loving, caring, and intimacy tended to be higher in the long-term relationship when condoms were not used. For the less exclusive relationships, women reported relatively lower levels of loving/loved and caring relative to men.

Reptilian erotic emotions increased as relationships became more exclusive; erotic feelings were stronger when condoms were not used, and males reported generally higher erotic feelings. Ratings of erotic feelings showed no significant interactions between gender and condom use or gender and relationship exclusivity. Overall, reptilian power emotions increased slightly as relationships became more exclusive, and feelings of power were marginally stronger when condoms were not used. As expected, power ratings showed a significant interaction between gender and condom use/nonuse: Women indicated relatively greater power when condoms were used and men indicated relatively greater power when condoms were not used. Also as expected, men reported more anger than women when a condom was used and women reported being more angry when a condom was not used.

To summarize, positive emotions were high and negative emotions low when condoms are used; these emotions vary widely with the exclusivity of the relationship when condoms are not used. Also, as expected from the reptilian rewards hypothesis, condom nonuse was associated with higher ratings on reptilian sex and power. Also as expected, when condoms are not used feelings of power are higher for men than women and feelings of anger are higher for women than men. The strong relationships between reported emotions, relationship exclusivity, and condom use/nonuse are consistent with the notion that emotional variables exert important influences on decisions to use or not use condoms. Also, the results demonstrate the intricacy and subtlety of the influence of specific emotions, including reptilian and prosocial emotions not often recognized in many contemporary emotion theories. The complex results concerning positive prosocial emotions – that condom use as opposed to nonuse was seen to be associated positively with caring feelings but negatively with intimacy – was not expected, but on reflection is understandable.

The present authors replicated the Buck et al. (2004) study in a previously unpublished study which examined the hypothesized emotions involved in risky sexual situations, as well as cognitions involved in the same situations, allowing the ARI model to be employed in the analysis. Participants were 337 students from a large Northeastern US University who completed an online and expanded version of the SAFECOMM scale in response to a diverse set of sexual situations (described above). They were asked to rate how “most people would feel” in seven scenarios: discussing condom use with a new sexual partner; and using or not using a condom within sexual relationships of three levels of exclusivity (one-night stand, acquaintance, long-term relationship). The reliabilities of the emotion scales in this study were high ($\alpha = 0.84\text{--}0.95$). Rational processing was operationalized by four questions about whether people think about using condoms (Do most people consider pros and cons of using a condom or not?) and three questions about whether people consider health consequences of using condoms (Do most people think about health consequences of using or not using a condom?) in each of the four situations (discussing, one-night stand, acquaintance, committed relationship). To obtain the A/R score for a given emotion, the emotion rating was divided by the mean of the reason items for each participant in that situation.

Highlights from our findings include the fact that positive prosocial and individualistic emotions increased as relationships become more committed, and negative prosocial and individualistic emotions decreased. Also, there were indications of relationship \times condom use interactions, such that increasing relationship exclusivity mitigated negative feelings associated with condom nonuse. But, this is not simply a matter of positivity and negativity: Reptilian sexual emotions were rated higher in committed relationships when condoms are NOT used, illustrating again the “reptilian rewards” of not using condoms. Regarding the A/R scores, or emotion *relative to reason*, discussing condom use was relatively the most “rational” of the situations, with reason predominating throughout. The most emotional situation was clearly the committed relationship, with positive prosocial, positive individualistic, reptilian power, and reptilian sex all rated as stronger than reason in that situation. Also, it is noteworthy that reptilian sex was at relatively high levels across the situations.

Together these results provide preliminary evidence for the potential effectiveness of a risk communication strategy that targets positive prosocial and individualistic emotions in the context of committed relationships, and negative prosocial and individualistic emotions in the context of more casual relationships. Additionally, a risk communication strategy that addresses sexual emotions related to condom nonuse may be promising, considering the high

levels of reptilian sex emotions associated with all situations and in particular with situations where condoms are NOT used. Additionally, emotion-based risk communication strategies may prevail over more social or cognitive strategies when addressing actual condom use as opposed to discussing condoms with a new partner, since the A/R scores demonstrate the most “rational” thinking in relation to discussions as opposed to actual sexually charged situations.

Further Research

Emotion Intervention Strategies: Emotional Education and Emotional Competence

One way to address emotions in risk communication is through *emotional education* (Buck 1983, 1985, 1990, 1994). Emotional education is a concept introduced in the Developmental Interactionist (DI) Theory of Emotion, which posits an interaction between reason and emotion that occurs during the course of normal individual development (Buck 1985, 1988, 1999, 2002). DI theory states that individuals learn how to label and understand feelings in childhood by interpreting others’ responses to their emotional displays, resulting in naturally occurring emotional education. Basically, emotional education is the process of teaching individuals to correctly (or incorrectly) identify emotions they are experiencing, and what to do when they occur.

Though DI theory posits emotional education as a naturally occurring process, it has also been proposed as means of risk communication and behavior change intervention (e.g., Buck 1985, 1990; McWhirter 1995), and encouraged as a means of supplementing existing risk messages, such as sexual risk reduction interventions (Shaughnessy and Shakesby 1992). According to Buck (1990), though individuals have generalized access to their subjective emotional feelings, they may be unable to consciously identify the cause of the emotion or label the emotion itself. Emotional education in a risk communication strategy may help individuals to identify and label the emotions they experience. When an individual is able to identify experienced emotions confidently and reliably, and can deal with and express them effectively in a way that is appropriate to the situation and in the individual’s best interest, this is considered *emotional competence*. Emotional competence is the desired outcome of any emotional education intervention (e.g., Buck 1985, 1990; Buck and Powers 2011; McWhirter 1995).

Research shows that individuals are relatively poor at anticipating how they will feel in a given situation, and how they will react to that emotion in the situation, when they are not emotional at the time of prediction (Finkenauer et al. 2007; Gilbert et al. 1998; Loewenstein 1996). Emotional education may be one way to help individuals to become better at anticipating their emotions, and in developing strategies in advance that might be helpful in dealing with these emotions in ways that facilitate more mindful and therefore safer sexual decision-making. For example, it may be possible to teach individuals to recognize and anticipate positive emotions associated with a healthy or safe behavior, or negative emotions associated with non-adherence to that behavior, and to either increase the experience and the anticipation of these emotions, as well as a strategic response to these emotions that results in the target behavior. If emotional education is successful, it could have a great impact on behavior: as stated above, anticipated and anticipatory emotions have both direct and indirect effects on judgment, decision-making, and behavior (e.g., Loewenstein and Lerner 2003).

In the advertising and marketing field, such an emotional-education approach is quite common. As described earlier, the popular advertising technique of branding involves educating individuals to associate particular affectively laden images with a certain brand, in order to increase emotions associated with the brand and strengthen the link between these emotions and purchase behavior (e.g., [Greifender et al. 2007](#); [Pritchard and Morgan 1998](#)). Branding's effects on consumer behavior are well-documented (e.g., [Buck and Davis 2010](#); [Chaudhuri 2006](#)).

Though most popular in advertising and marketing, emotional education strategies have been used preliminarily in the risk communication domain as well, though with far less prevalence than in the advertising industry. For example, recent research has directed individuals, through use of role-playing, to "pre-live" emotional consequences of positive and negative genetic testing results when making the decision whether or not to engage in such testing behavior ([Diefenbach and Hamrick 2003](#); [Miller et al. 2001](#)). This pre-living of emotion can be seen as a form of emotional education.

One potentially efficacious method of facilitating emotional education and emotional competence is through the use of videos, as people often seek out media for emotional education in everyday life. Videos offer unique access to both the feelings of others as well as a viewer's own feelings by detailing situations in which actors are confronted with emotional stimuli and describe their physical and emotional responses (e.g., [Buck 1988](#); [Boyanowsky et al. 1972](#); [Cantor 1982](#)). Movies provide opportunities to consider situations that would provoke various emotional outcomes, as well as examples of others' responses to such situations. For example, [Boyanowsky et al. \(1972\)](#) found that, after a murder took place on campus, attendance at a movie depicting a murder increased, while attendance at a similar film with no murder remained steady, as compared to showings of the same two movies prior to the campus murder. Further, women who lived in the same dorm as the murdered woman were more likely to choose to attend the murder movie than the other movie. This could indicate that individuals may seek out videos in order to facilitate their own emotional education and competence after an emotional event occurs in real life. Thus, media and film are a natural way to facilitate emotional education and emotional competence in risk communication, and can be used in risk messages to affect systematic exposure to different affective-laden situations in a manner that would not otherwise be possible.

Indeed, recent research has demonstrated that videos designed to facilitate emotional education and emotional competence with relation to sexual situations significantly increased condom use when paired with traditional social-cognitive intervention material ([Ferrer et al. 2011](#)). The emotional education intervention content was designed to increase individuals' identification and anticipation of specific emotions and to facilitate enactment of response strategies that result in condom use. The design of the intervention drew on results of the SAFECOMM studies described above. The videos addressed sexual situations that occur both inside and outside the context of a committed relationship, and emotions identified by the SAFECOMM studies to be particularly relevant in each context. Positive prosocial and individualistic emotions, such as caring, intimacy, and confidence, were addressed in the context of committed relationships. Also, positive individualistic emotions were targeted in the context of more casual relationships, in addition to targeting negative prosocial and individualistic emotions such as embarrassment, guilt, and detachment. Sexual reptilian emotions were addressed in both relationship contexts, as these were associated with all situations and in particular in situations where condoms were *not* used. All participants

watched videos about both relationship contexts, as relationships among college students can be transient and as such, these individuals may quickly move from a committed to a casual relationship status (or vice versa).

Participants watched the videos designed to highlight these relevant emotions: love and caring for a partner that can be expressed with condom use; confidence and security in a sexual situation as a result of condom use; embarrassment or guilt associated with not using a condom; and eroticism that could be achieved even while using a condom. Discussions followed the videos to reinforce the emotional education. Individuals were randomly assigned, in small groups, to receive (1) the emotional education intervention paired with traditional social-cognitive intervention material, (2) the social-cognitive intervention material only, or (3) no intervention. Compared to the control condition, both the intervention conditions reported increased condom use at 3 months post-intervention. However, at 6 months post-intervention, only the group who had received the emotional education intervention sustained changes in condom use behavior. This study provides preliminary evidence suggesting that emotional appeals to health promotion behavior may be more efficacious in sustaining behavior change than more “rational” appeals alone. Additionally, the intervention was one of few single session interventions demonstrated to increase and sustain condom use, indicating the powerful potential of emotional appeals in effecting desired behavior change. Additional research is necessary to replicate these findings and to demonstrate their efficacy in other health and safety domains; however, these findings provide convincing evidence that such strategies have promise and should be examined further as risk communication strategies that could be used effectively by public health and safety officials.

One essential direction for future research concerns evaluating the effectiveness of emotional appeals in the “real world.” Although such appeals have been demonstrated to change behavior in laboratory and more controlled settings, there is no definitive empirical evidence to demonstrate what types of emotional appeals are most likely to be effected in “the sophisticated and overcrowded clutter of the real-world communications environment” (Hastings et al. 2004). We also know little empirically about the long-term exposure to repeated emotional appeals (Hastings et al. 2004). The marketing and advertising industry has certainly demonstrated that repeated emotional appeals distributed en masse to the public can be utilized effectively (e.g., Chaudhuri 2006). However, publicly available empirical evidence concerning the properties and characteristics of effective (and ineffective) appeals at the mass communication level is sparse. Additional research is necessary to determine what types of emotional appeals are most likely to translate from a controlled environment to the real world.

Conclusion

In conclusion, the Ferrer et al. (2011) study illustrates the potential of incorporating explicit emotional education appeals in risk messages and interventions. By first understanding the specific emotions that are likely to be encountered in a risky situation, and then by presenting information on how to understand and deal with those emotions, it becomes possible to alert vulnerable persons to anticipate their feelings and desires in ways that promote mindful choice: to appreciate, for example, that sexually transmitted diseases do not “stay in Vegas.” The promotion of mindful choice is clearly beneficial and ethical, even though it may at times

involve manipulating emotion. The full potential of such warning tactics and strategies have yet to be fully tested and evaluated, but they are based upon both the latest research evidence and the compelling and sobering long-term example of success of advertising and marketing.

References

- Ahern G, Schwartz G (1979) [Differential lateralization for positive versus negative emotion. *Neuropsychologia* 17:693–698](#)
- Alhakami AS, Slovic P (1994) [A psychological study of the inverse relationship between perceived risk and perceived benefit. *Risk Anal* 14:1085–1096](#)
- American Psychiatric Association (1994) [Diagnostic and statistical manual of mental disorders, 4th edn, revised. American Psychiatric Association, Washington, DC](#)
- Andrade EB, Ariely D (2009) [The enduring impact of transient emotions on decision making. *Organ Behav Hum Decis Process* 109:1–8](#)
- Arnold M (1960) [Emotions and personality, vol 1 and 2. Columbia University Press, New York](#)
- Arthur D, Quester P (2003) [The ethicality of using fear for social advertising. *Australas Mark J* 11:12–27](#)
- Ashwin E, Baron-Cohen S, Wheelwright S, O’Riordan M, Bullmore ET (2007) [Differential activation of the amygdala and the ‘social brain’ during fearful face-processing in Asperger Syndrome. *Neuropsychologia* 45:2–14](#)
- Baas D, Aleman A, Kahn RS (2004) [Lateralization of amygdala activation: a systematic review of functional neuroimaging studies. *Brain Res Rev* 45:96–103](#)
- Bagozzi RP, Baumgartner H, Pieters R (1998) [Goal-directed emotions. *Cogn Emotion* 12:1–26](#)
- Baker KB, Kim JJ (2004) [Amygdalar lateralization in fear conditioning: evidence for greater involvements of the right amygdala. *Behav Neurosci* 118:15–23](#)
- Balconi M, Falbo L, Brambilla E (2009) [BIS/BAS responses to emotional cues: self report, autonomic measure, and alpha brain modulation. *Pers Individ Differ* 47:858–863](#)
- Baron-Cohen S, Jolliffe T, Mortimore C, Robertson M (1997) [Another advanced test of theory of mind: evidence from very high functioning adults with autism or Asperger syndrome. *J Psychol Psychiatry Allied Discip* 38:812–822](#)
- Batra R, Ray ML (1983) [Conceptualizing involvement as depth and quality of cognitive response. In: Bagozzi RP, Tybout AM \(eds\) *Advances in consumer research*, vol 10. Association for Consumer Research, Ann Arbor, pp 309–313](#)
- Beauchamp TL (1988) [Manipulative advertising. In: Beauchamp TL, Bowie NE \(eds\) *Ethical theory and business*, 3rd edn. Prentice Hall, Englewood Cliffs](#)
- Bechara A (2004) [The role of emotion in decision-making: evidence from neurological patients with orbitofrontal damage. *Brain Cogn* 55:30–40](#)
- Bechara A, Damasio H, Tranel D, Damasio AR (1997) [Deciding advantageously before knowing the advantageous situation. *Science* 285:1293–1294](#)
- Bechara A, Damasio H, Damasio AR (2000) [Emotion, decision-making, and the orbitofrontal cortex. *Cereb Cortex* 10:295–307](#)
- Bechara A, Damasio H, Tranel D, Anderson SW (2001) [Dissociation of working memory from decision making within the human prefrontal cortex. *J Neurosci* 18:428–437](#)
- Benet S, Pitts RE, LaTour M (1993) [The appropriateness of fear appeal use for health-care marketing to the elderly – is it OK to scare granny? *J Bus Ethics* 12:45–55](#)
- Berridge KC, Aldridge JW (2008) [Decision utility, the brain, and the pursuit of hedonic goals. *Soc Cogn* 26:621–646](#)
- Bless H (2000) [Moods and general knowledge structures: happy moods and their impact on information processing. In: Forgas JP \(ed\) *Feeling and thinking: the role of affect in social cognition*. Cambridge University Press, New York, pp 131–142](#)
- Bogen JE (1985) [The callosal syndromes. In: Heilman KM, Valenstein E \(eds\) *Brain mechanisms underlying speech and language*. Grune and Stratton, New York](#)
- Borod J, Koff E (1990) [Lateralization of facial emotional behavior: a methodological perspective. *Int J Psychol* 25:157–177](#)
- Borod J, Koff E, Buck R (1986) [The neuropsychology of facial expression: data from normal and brain-damaged adults. In: Blanck P, Buck R, Rosenthal R \(eds\) *Nonverbal communication in the clinical context*. Penn State University Press, University Park](#)
- Borod JC, Cicero BA, Obler LK, Welkowitz J, Erhan HM, Santschi C, Grunwald IS, Agosti RM, Whalen JR (1998) [Right hemisphere emotional perception: evidence across multiple channels. *Neuropsychology* 12\(3\):446–458](#)

- Bower GH (1991) Mood congruity of social judgments. In: Forgas JP (ed) *Emotion and social judgments*. Pergamon, New York, pp 31–53
- Boyanowsky EO, Newton D, Walster E (1972) [Film preferences following a murder](#). *Commun Res* 1:32–43
- Buchnan TW, Tranel D, Adolphs R (2006) [Memories for emotional autobiographical events following unilateral damage to medial temporal lobe](#). *Brain* 129:115–127
- Buck R (1983) Emotional development and emotional education. In: Plutchik R, Kellerman H (eds) *Emotion in early development*. Academic, New York
- Buck R (1985) Prime theory: an integrated view of motivation and emotion. *Psychol Rev* 92:389–413
- Buck R (1988) *Human motivation and emotion*, 2nd edn. Wiley, New York
- Buck R (1990) Rapport, emotional education, and emotional competence. *Psychol Inq* 1:301–302
- Buck R (1994) [The neuropsychology of communication: spontaneous and symbolic aspects](#). *J Pragmatics* 22:265–278
- Buck R (1999) [The biological affects: a typology](#). *Psychol Rev* 106:301–336
- Buck R (2002) [The genetics and biology of true love: prosocial biological affects and the left hemisphere](#). *Psychol Rev* 109:739–744
- Buck R, Davis WA (2010) Marketing risk: emotional appeals can promote the mindless acceptance of risk. In: Roeser S (ed) *Emotions and risky technologies*. Springer, Berlin
- Buck R, Duffy RJ (1980) Nonverbal communication of affect in brain-damaged patients. *Cortex* 16:351–362
- Buck R, Powers SR (2011) Emotion, media, and the global village. In: Döveling K, von Scheve C, Konijn EA (eds) *The routledge handbook of emotions and mass media*. Routledge, Abingdon, Oxon, New York
- Buck R, Van Lear CA (2002) Verbal and nonverbal communication: distinguishing symbolic, spontaneous, and pseudo-spontaneous nonverbal behavior. *J Commun* 52:522–541
- Buck R, Anderson E, Chaudhuri A, Ray I (2004) [Emotion and reason in persuasion: applying the ARI model and the CASC scale](#). *J Bus Res* 57:647–656
- Cahill L (2005) His brain, her brain. *Sci Am* 292(5):40–47
- Cahill L, Uncapher M, Kilpatrick L, Alkire MT, Turner J (2004) Sex-related hemispheric lateralization of amygdala function in emotionally influenced memory: an fMRI investigation. *Learning and memory*. *Learn Mem* 11:261–266
- Calder AJ (2003) Disgust discussed. *Ann Neurol* 53:427–428
- Calder AJ, Keane J, Manes F, Antoun N, Yong AW (2000) [Impaired recognition and experience of disgust following brain injury](#). *Nat Neurosci* 3:1077–1078
- Cantor J (1982) Developmental studies of children's fright from mass media. In: Paper presented at the convention of the International Communication Association, Dallas
- Chaudhuri A (2006) Emotion and reason in consumer behavior. Butterworth, Woburn
- Chaudhuri A, Buck R (1995) Media differences in rational and emotional responses to advertising. *J Broadcasting Electron Media* 39(1):109–125
- Cialdini RB, Goldstein NJ (2004) [Social influence: compliance and conformity](#). *Annu Rev Psychol* 55:591–621
- Clore GL, Gasper K, Garvin E (2002) Affect as information. In: Forgas JP (ed) *Handbook of affect and social cognition*. Lawrence Erlbaum, Mahwah
- Coleman-Meschkes K, McGaugh JL (1995a) Differential involvement of the right and left amygdalae in expression of memory for aversively-motivated training. *Brain Res* 670:75–81
- Coleman-Meschkes K, McGaugh JL (1995b) [Muscimol injected into the right or left amygdaloid complex differentially affects retention performance following aversively motivated training](#). *Brain Res* 676:183–188
- Coleman-Meschkes K, McGaugh JL (1995c) [Muscimol injected into the right or left amygdaloid complex differentially affects retention performance following aversively motivated training](#). *Brain Res* 676:183–188
- Coleman-Meschkes K, Salinas JA, McGaugh JL (1996) [Unilateral amygdala inactivation after training attenuates memory for reduced reward](#). *Behav Brain Res* 77:175–108
- Cox EP, Wogalter MS, Stokes SL (1997) Do product warnings increase safe behavior? A meta-analysis. *J Public Policy Mark* 16:195–204
- Damasio A (1994) *Descartes' error: emotion, reason, and the human brain*. Gosset/Putnam, New York
- Davidson RJ (1992) Prolegomenon to the structure of emotions: Gleanings from neuropsychology. *Cogn Emot* 6:245–258
- Davidson RJ, Fox NA (1982) [Asymmetrical brain activity discriminates between positive and negative affective stimuli in human infants](#). *Science* 218:1235–1237
- Davidson RJ, Irwin W (1999) The functional neuroanatomy of emotion and affective style. *Trends Cogn Sci* 3:11–21
- Denenberg VH (1981) [Hemispheric laterality in animals and the effects of early experience](#). *Behav Brain Sci* 4:1–19
- Denenberg VH (1984) Behavioral asymmetry. In: Geschwind N, Galaburda AM (eds) *Cerebral dominance: the biological foundations*. Harvard University Press, Cambridge, MA, pp 114–133

- Des Roches ADB, Richard-Yris M-A, Henry S, Ezzaouia M, Hausberger M (2008) Laterality and emotions: visual laterality in the domestic horse (*Equus caballus*) differs with objects' emotional value. *Physiol Behav* 94:487–490
- Diefenbach MA, Hamrick N (2003) Self-regulation and genetic testing. In: Cameron LD, Leventhal H (eds) *The self-regulation of health and illness behavior*. Routledge, London, pp 314–331
- Diefenbach MA, Miller SM, Porter M, Peters E, Stefanek M, Leventhal H (2008) Emotions and health behavior: a self-regulation perspective. In: Lewis M, Haviland-Jones JM, Feldman Barrett L (eds) *Handbook of emotions*. Guilford, New York
- Donegan NH et al (2003) Amygdala hyperreactivity in borderline personality disorder: implications for emotional dysregulation. *Biol Psychiatry* 54(11):1284–1293
- Druckman JN, McDermott R (2008) Emotion and the framing of risky choice. *Polit Behav* 30:297–321
- Ekman P, Friesen WV (1975) *Unmasking the face*. Prentice Hall, Englewood Cliffs
- Elster J (1998) Emotions and economic theory. *J Econ Lit* 36:47–74
- Etcoff NL (1989) Recognition of emotion in patients with unilateral brain damage. In: Gainotti G, Caltagirone C (eds) *Emotions and the dual brain*. Experimental brain research series 18. Springer, New York, pp 168–186
- Ferrer RA, Fisher JD, Buck R, Amico KR (2011) Adding emotional education to a social-cognitive sexual risk reduction intervention may sustain behavior change. *Health Psychol* (ePub ahead of print)
- Fiedler K (2000) Towards an integrative account of affect and social cognition phenomena. In: Forgas JP (ed) *Feeling and thinking: the role of affect in social cognition*. Cambridge University press, Cambridge, pp 223–252
- Fine C, Lumsden J, Blair RJR (2001) Dissociation between 'theory of mind' and executive functions in a patient with early left amygdala damage. *Brain* 124:287–298
- Finkenauer C, Gallucci M, van Dijk WW, Pollmann M (2007) Investigating the role of time in affective forecasting: temporal influences on forecasting accuracy. *Pers Soc Psychol Bull* 33:1152–1166
- Finucane ML (2008) Emotion, affect, and risk communication with older adults: challenges and opportunities. *J Risk Res* 11:983–997
- Finucane ML, Peters E, Slovic P (2003) Judgment and decision making: the dance of affect and reason. In: Schneider SL, Shanteau J (eds) *Emerging perspectives on judgment and decision research*. Cambridge University Press, Cambridge, pp 327–364
- Fischhoff B, Slovic P, Lichtenstein S, Read S, Combs B (1978) How safe is safe enough? A psychometric study of attitudes toward technological risks and benefits. *Policy Sci* 9:127–152
- Fischhoff B, Gonzalez RM, Lerner JS, Small DA (2005) Evolving judgments of terror risks: foresight, hindsight, and emotion. *J Exp Psychol Appl* 11:124–139
- Forgas JP (1995) Mood and judgment: the affect infusion model (AIM). *Psychol Bull* 117:39–66
- Forgas JP (1999) On feeling good and being rude: affective influences on language use and request formulations. *J Pers Soc Psychol* 76:928–939
- Forgas JP, Bower GH, Moylan SJ (1990) Praise or blame? Affective influences in attributions for achievement. *J Pers Soc Psychol* 59:809–818
- Gaspar K, Clore GL (1998) The persistent use of negative affect by anxious individuals to estimate risk. *J Pers Soc Psychol* 74:1350–1363
- Gilbert DT, Pinel EC, Wilson TD, Blumberg SJ, Wheatley TP (1998) Immune neglect: a source of durability bias in affective forecasting. *J Pers Soc Psychol* 75:617–638
- Greifender R, Bless H, Kuschmann T (2007) Extending the brand image on new products: the *facilitative effect of happy mood states*. *J Consum Behav* 6:19–31
- Griskevicius V, Goldstein NJ, Mortensen CR, Sundie JM, Cialdini RB, Kenrick DT (2009) Fear and loving in Las Vegas: evolution, emotion, and persuasion. *J Mark Res* 46:384–395
- Griskevicius V, Shiota MN, Neufeld SL (2010) Influence of different positive emotions on persuasion processing: a functional evolutionary approach. *Emotion* 10:190–206
- Grunberg NE, Straub RO (1992) The role of gender and taste class in the effects of stress on eating. *Health Psychol* 11:97–100
- Gur RC, Mozley LH, Mozley DP, Resnick SM, Karp JS, Alavi A, Arnold SE, Gur RE (1995) Sex differences in regional cerebral glucose metabolism during resting state. *Science* 267:528–531
- Han S, Lerner JS, Keltner D (2007) Feelings and consumer decision making: the appraisal-tendency framework. *J Consum Psychol* 17:158–168
- Hardee JE, Thompson JC, Puce A (2008) The left amygdala knows fear: laterality in the amygdala response to fearful eyes. *Soc Cogn Affect Neurosci* 3:47–54
- Harle KM, Sanfey AG (2007) Incidental sadness biases social economic decisions in the ultimatum game. *Emotion* 7:876–881
- Harmon-Jones E, Gable PA, Peterson CK (2010) The role of asymmetric frontal cortical activity in emotion-related phenomena: a review and update. *Biol Psychol* 84:451–462

- Hastings G, Stead M, Webb J (2004) Fear appeals in social marketing: strategic and ethical reasons for concern. *Psychol Mark* 21:961–986
- Hilton D (2008) Emotional tone and argumentation in risk communication. *Judgment Decis Mak* 3:100–110
- Holstege G, Georgiadis JR, Paans AMJ, Meiners LC, Ferdinand HCE, van der Graaf FHCE, Simone Reinders AAT (2003) Brain activation during human male ejaculation. *J Neurosci* 23(27): 9185–9193
- Hsee CK, Weber EU (1997) A fundamental prediction error: self-other discrepancies in risk preference. *J Exp Psychol Gen* 126:45–53
- Janszky J, Szucs A, Halasz P, Borbely C, Hollo A, Barsi P et al (2002) Orgasmic aura originates from the right hemisphere. *Neurology* 58:302–304
- Johnson EJ, Tversky A (1983) Affect, generalization, and the perception of risk. *J Pers Soc Psychol* 45:20–31
- Keltner D, Haidt J, Shiota MN (2006) Social functionalism and the evolution of emotions. In: Schaller M, Simpson JA, Kenrick DT (eds) *Evolution and social psychology*. Psychosocial Press, Madison, pp 115–142
- Killgore WD, Yurgelun-Todd DA (2001) Sex differences in amygdala activation during the perception of facial affect. *Neuroreport* 12:2543–2547
- Killgore WDS, Oki M, Yurgelun-Todd DA (2000) Sex-specific developmental changes in amygdala responses to affective faces. *Neuroreport* 12: 427–433
- Klein WMP, Zajac LE, Monin MM (2009) Worry as a moderator of the association between risk perceptions and quitting intentions in young adult and adult smokers. *Ann Behav Med* 38(3):256–261
- Kliver H, Bucy PC (1939) Preliminary analysis of functions of the temporal lobe in monkeys. *Arch Neurol Psych Chicago* 42:979–1000
- Koenigsberg HW, Sievera LJ, Lee H, Pizzarello S, Newa AS, Goodman M, Cheng H, Flory J, Prohovnik I (2009) Neural correlates of emotion processing in borderline personality disorder. *Psychiatry Res Neuroimaging* 172:192–199
- Kowta S, Buck R (1995) A cross-cultural study of product involvement using the ARI model and the CASC scale. In: Paper presented at the meeting of the American Psychological Association, New York, 12 Aug 1995
- Kunst-Wilson WR, Zajonc RB (1980) Affective discrimination of stimuli that cannot be recognized. *Science* 207:557–558
- Lawton R, Conner M, McEachan R (2009) Desire or reason: predicting health behaviors from affective and cognitive attitudes. *Health Psychol* 28:56–65
- Lazarus RS (1982a) Thoughts on the relations between affect and cognition. *Am Psychol* 37:1019–1024
- Lazarus RS (1982b) On the primacy of cognition. *Am Psychol* 39:124–129
- Lazarus RS (1991a) *Emotion and adaptation*. Oxford University Press, Oxford
- Lazarus RS (1991b) Cognition and motivation in emotion. *Am Psychol* 46:352–367
- Lazarus RS (1994a) Universal antecedents of emotion. In: Ekman P, Davidson RJ (eds) *The nature of emotion: fundamental questions*. Oxford University Press, New York, pp 163–171
- Lazarus RS (1994b) Appraisal: the long and the short of it. In: Ekman P, Davidson RJ (eds) *The nature of emotion: fundamental questions*. Oxford University Press, New York, pp 208–215
- Lazarus RC, Alfert E (1964) Short-circuiting of threat by experimentally altering cognitive appraisal. *J Abnorm Soc Psychol* 69:195–205
- LeDoux J (1986) The neurobiology of emotion. In: LeDoux J, Hirst W (eds) *Mind and brain: dialogues in cognitive neuroscience*. Cambridge University Press, New York, pp 301–354
- LeDoux J (1996) *The emotional brain*. Simon & Schuster, New York
- LeDoux JE (1994) Cognitive-emotional interactions in the brain. In: Ekman P, Davidson RJ (eds) *The nature of emotion: fundamental questions*. Oxford University Press, New York, pp 216–223
- LeDoux JE, Sakaguchi A, Reis DJ (1984) Subcortical efferent projections of the medial geniculate nucleus mediate emotional responses conditioned to acoustic stimuli. *J Neurosci* 4:683–698
- Lerner JS, Keltner D (2000) Beyond valence: toward a model of emotion-specific influences on judgment and choice. *Cogn Emotion* 14:473–494
- Lerner JS, Keltner D (2001) Fear, anger, and risk. *J Pers Soc Psychol* 81:146–159
- Lerner JS, Gonzalez R, Small D, Fischhoff B (2003) Effects of fear and anger on perceived risk of terrorism: a national field experiment. *Psychol Sci* 14:144–150
- Lerner JS, Small DA, Loewenstein GF (2004) Heart strings and purse strings: carry-over effects of emotions on economic transactions. *Psychol Sci* 15:337–341
- Lipkus IM, Klein WMP, Skinner CS, Rimer BK (2005) Breast cancer risk perceptions and breast cancer worry: what predicts what? *J Risk Res* 8:439–452
- Loewenstein G (1996) Out of control: visceral influences on behavior. *Organ Behav Hum Decis Process* 65:272–292
- Loewenstein GF, Lerner JS (2003) The role of affect in decision making. In: Davidson R, Scherer K, Goldsmith H (eds) *Handbook of affective science*. Oxford University Press, New York, pp 619–642
- Loewenstein GF, Weber EU, Hsee CK, Welch N (2001) Risk as feelings. *Psychol Bull* 127:267–286

- MacLean PD (1993) Cerebral evolution of emotion. In: Lewis M, Haviland J (eds) *Handbook of emotions*. Guilford, New York, pp 67–83
- Markowitsch HJ (1998) Differential contribution of right and left amygdala to affective information processing. *Behav Neurol* 11:233–244
- McQuarrie EF, Munson JM (1987) The Zaichkowsky personal involvement inventory: modification and extension. In: *Advances in consumer research*, vol 14. Association for Consumer Research, Ann Arbor, pp 36–40
- McWhirter JJ (1995) Emotional education for university students. *J Coll Stud Psychother* 10:27–38
- Miller S, Diefenbach MA, Kruus L, Ohls L, Hanks G, Bruner D (2001) Psychological and screening profiles of first degree relatives of prostate cancer patients. *J Behav Med* 24:247–258
- Ness RM, Klaas R (1994) Risk perception by patients with anxiety disorders. *J Nerv Ment Dis* 182:466–470
- Norton TR, Bogart LM, Cecil H, Pinkerton SD (2005) Primacy of affect over cognition in determining adult men's condom-use behavior. *J Appl Soc Psychol* 35:2493–2534
- Panksepp J (1994) A proper distinction between cognitive and affective process is essential for neuroscientific progress. In: Ekman P, Davidson RJ (eds) *The nature of emotion: fundamental questions*. Oxford University Press, New York, pp 224–226
- Peters E, Slovic P (2000) The springs of action: affective and analytical information processing in choice. *Pers Soc Psychol Bull* 26:1465–1475
- Phelps EA, O'Connor KJ, Gatenby JC, Gore JC, Grillon C, Davis M (2001) Activation of the left amygdala to a cognitive representation of fear. *Nat Neurosci* 4:437–441
- Pritchard A, Morgan N (1998) 'Mood marketing' – the new destination branding strategy: a case study of 'Wales' brand. *J Vacation Mark* 4:215–229
- Prodan CI, Orbelo DM, Testa JA, Ross ED (2001) Hemispheric differences in recognizing upper and lower facial displays of emotion. *Neuropsychiatry Neuropsychol Behav Neurol* 14:206–212
- Raghunathan R, Pham MT (1999) All negative moods are not equal: motivational influences of anxiety and sadness on decision making. *Organ Behav Hum Decis Process* 79:56–77
- Rolls J (1999) *The brain and emotion*. Oxford University Press, New York
- Ross E (1981) The aprosodias: functional-anatomic organization of the affective components of language in the right hemisphere. *Arch Neurol* 38:561–569
- Ross ED (1992) Lateralization of affective prosody in the brain. *Neurology* 42(Suppl 3):411
- Ross ED, Homan R, Buck R (1994) Differential hemispheric lateralization of primary and social emotions. *Neuropsychiatry Neuropsychol Behav Neurol* 7:1–19
- Rottenstreich Y, Hsee CK (2001) Money, kisses, and electric shocks: on the affective psychology of risk. *Psychol Sci* 12:185–190
- Rozin P, Haidt J, McCauley CR (1993) Disgust. In: Lewis M, Haviland J (eds) *Handbook of emotions*. Guilford, New York, pp 575–594
- Schneider F, Grodd W, Weiss U, Klose U, Mayer KR, Nägele T, Gur RC (1997) Functional MRI reveals left amygdala activation during emotion. *Psychiatry Res* 76:75–82
- Schwarz N (2002) Situated cognition and the wisdom of feelings: cognitive tuning. In: Feldman Barrett L, Salovey P (eds) *The wisdom in feelings*. Guilford, New York, pp 144–166
- Schwarz N, Clore GL (1983) Mood, misattribution, and judgments of well-being: informative and directive functions of affective states. *J Pers Soc Psychol* 45:513–523
- Shamay-Tsoory SG, Lavidor M, Aharon-Peretz J (2008) Social learning modulates the lateralization of emotional valence. *Brain Cogn* 67:280–291
- Shaughnessy ME, Shakesby P (1992) Adolescent sexual and emotional intimacy. *Adolescence* 27:475–480
- Silberman EK, Weingartner H (1986) Hemispheric lateralization of functions related to emotion. *Brain Cogn* 5:322–353
- Slovic P (1987) Perception of risk. *Science* 236:280–285
- Slovic P, Finucane ML, Peters E, MacGregor DG (2004) Risk as analysis and risk as feelings: some thoughts about affect, reason, risk, and rationality. *Risk Anal* 24:311–322
- Smith SD, Abou-Khalil B, Zaid DH (2008) Posttraumatic stress disorder in a patient with no left amygdala. *J Abnorm Psychol* 117:479–484
- Spiesman JC, Lazarus RC, Mordkoff AM, Davidson LA (1964) Experimental reduction of stress based on ego-defense theory. *J Abnorm Soc Psychol* 68:367–380
- Straube T, Weisbrod A, Schmidt S, Raschdorf C, Preul C, Mentzel H-J, Miltner WHR (2010) No impairment of recognition and experience of disgust in a patient with a right-hemispheric lesion of the insula and basal ganglia. *Neuropsychologia* 48:1735–1741
- Strauss E (1986) Cerebral representation of emotion. In: Blanck P, Buck R, Rosenthal R (eds) *Nonverbal communication in the clinical context*. Pennsylvania State University Press, University Park/London, pp 176–196
- Szabo CA, Xiong J, Lancaster JL, Rainey L, Fox P (2001) Amygdalar and hippocampal volumetry in control participants. *Am J Neuroradiol* 22:1342–1345

- Thaler RH, Sustein CR (2008) *Nudge: improving decisions about health, wealth, and happiness*. Yale University Press, New York
- Tucker DM (1981) Lateral brain function, emotion, and conceptualization. *Psychol Bull* 89:19–46
- Weinstein ND (1989) Effects of personal experience on self-protective behavior. *Psychol Bull* 105:31–50
- Weinstein ND, Kwitel A, McCaul KD, Magnan RE, Gerrard M, Gibbons FX (2007) Risk perceptions: assessment and relationship to influenza vaccination. *Health Psychol* 26:146–151
- Wilson WR (1979) Feeling more than we can know: exposure effects without learning. *J Pers Soc Psychol* 37:811–821
- Zajonc RB (1980) Feeling and thinking: preferences need no inference. *Am Psychol* 35:151–175
- Zajonc R (1984) On the primacy of affect. *Am Psychol* 39:117–123

