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Affect, Risk, and Decision Making

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Risk is perceived and acted on in 2 fundamental ways. *Risk as feelings* refers to individuals' fast, instinctive, and intuitive reactions to danger. *Risk as analysis* brings logic, reason, and scientific deliberation to bear on risk management. Reliance on risk as feelings is described with "the affect heuristic." The authors trace the development of this heuristic across a variety of research paths. The authors also discuss some of the important practical implications resulting from ways that this heuristic impacts how people perceive and evaluate risk, and, more generally, how it influences all human decision making. Finally, some important implications of the affect heuristic for communication and decision making pertaining to cancer prevention and treatment are briefly discussed.

Keywords: risk perception, risk analysis, the affect heuristic, rationality

Risk in the modern world is perceived and acted on in two fundamental ways. *Risk as feelings* refers to individuals' fast, instinctive, and intuitive reactions to danger. *Risk as analysis* brings logic, reason, and scientific deliberation to bear on risk management. In the present article, we examine what recent research in psychology and cognitive neuroscience reveals about risk as feelings and how it may influence judgments and decisions in cancer prevention and control.

Background and Theory: The Importance of Affect

Although the visceral emotion of fear certainly plays a role in risk as feelings, we focus here on a "faint whisper of emotion" called *affect*. As used here, affect means the specific quality of goodness or badness (a) experienced as a feeling state (with or without consciousness) and (b) demarcating a positive or negative quality of a stimulus. Affective responses occur rapidly and automatically—note how quickly you sense the feelings associated with the stimulus word *treasure* or the word *hate*. We argue that reliance on such feelings can be characterized as "the affect heuristic," with the experienced feelings being used as information in the decision process. In this article, we trace the development of the affect heuristic across a variety of research paths followed by ourselves and many others. We also discuss some of the important practical implications resulting from the ways that this heuristic impacts how individuals perceive and evaluate risk and, more generally, how it influences all human decision making. Finally, we briefly discuss some important implications for communication and decision making pertaining to cancer prevention and treatment.

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Two Modes of Thinking

Affect plays a central role in what have come to be known as *dual-process theories of information processing* (Cameron & Leventhal, 2003; Chaiken & Trope, 1999; Sloman, 1996). As Epstein (1994) observed,

> There is no dearth of evidence in every day life that people apprehend reality in two fundamentally different ways, one variously labeled intuitive, automatic, natural, nonverbal, narrative, and experiential, and the other analytical, deliberative, verbal, and rational. (p. 710)

One of the main characteristics of the experiential system is its affective basis. Although analysis is certainly important in some decision-making circumstances, reliance on affect and emotion is a quicker, easier, and more efficient way to navigate in a complex, uncertain, and sometimes dangerous world. Many theorists have given affect a direct and primary role in motivating behavior.

There are strong elements of rationality in both systems. It was the experiential system, after all, that enabled human beings to survive during their long period of evolution. Long before there was probability theory, risk assessment, and decision analysis, there were intuition, instinct, and gut feeling to tell people whether an animal was safe to approach or the water was safe to drink. As life became more complex and humans gained more control over their environment, analytic tools were invented to "boost" the rationality of their experiential thinking. Subsequently, analytic thinking was placed on a pedestal and portrayed as the epitome of rationality. Affect and emotions were seen as interfering with reason.

The importance of affect, however, is being recognized increasingly by decision researchers. A strong early proponent was

Zajonc (1980) who argued that affective reactions to stimuli are often the very first reactions, occurring automatically and subsequently guiding information processing and judgment. If Zajonc is correct, then affective reactions may serve as orienting mechanisms, helping individuals make decisions quickly and efficiently.

Researchers now recognize that the experiential mode of thinking and the analytic mode of thinking are continually active. While people may be able to "do the right thing" without analysis (e.g., dodge a falling object), it is unlikely that they can use analytic thinking rationally without guidance from affect somewhere along the line. Affect is essential to rational action (Damasio, 1994).

The Affect Heuristic

The feelings that become salient in a judgment or decision-making process depend on characteristics of the individual and the task as well as the interaction between them. Individuals differ in the way they react affectively and in their tendency to rely on experiential thinking (Gasper & Clore, 1998; Peters & Slovic, 2000). As shown in this article, tasks also differ regarding the evaluability (relative affective salience) of information. These differences result in the affective qualities of a stimulus image being "mapped" or interpreted in diverse ways. The salient qualities of real or imagined stimuli then evoke images (perceptual and symbolic interpretations) that may be made up of both affective and instrumental dimensions.

All of the images in people's minds are tagged or marked to varying degrees with affect. An individual's "affect pool" contains all of the positive and negative markers associated (consciously or unconsciously) with the images. The intensity of the markers varies with the images.

People consult or "sense" the affect pool in the process of making judgments. Just as imaginability, memorability, and similarity serve as cues for probability judgments (e.g., the availability and representativeness heuristics; Kahneman, Slovic, & Tversky, 1982), affect may serve as a cue for many important judgments (including probability judgments). Using an overall, readily available affective impression can be easier and more efficient than weighing the pros and cons of various reasons or retrieving relevant examples from memory, especially when the required judgment or decision is complex or mental resources are limited. This characterization of a mental shortcut has led researchers to label the use of affect a *heuristic* (Finucane, Alhakami, Slovic, & Johnson, 2000).

Empirical Support for the Affect Heuristic

Support for the affect heuristic comes from a diverse set of empirical studies, only a few of which are reviewed here.

Early Research: Dread and Outrage in Risk Perception

Evidence of risk as feelings was present (though not fully appreciated) in early psychometric studies of risk perception (Fischhoff, Slovic, Lichtenstein, Read, & Combs, 1978; Slovic, 1987). Those studies showed that feelings of dread were the major determiner of public perception and acceptance of risk for a wide range of hazards. Sandman (1989), noting that dread was also associated with factors such as voluntariness, controllability, lethality, and fairness, incorporated these qualities into his "outrage model." Reliance on outrage was, in Sandman's view, the major reason that public evaluations of risk differed from expert evaluations (based on analysis of hazard; e.g., mortality statistics).

Risk and Benefit Judgments

The earliest studies of risk perception also found that, whereas risk and benefit tend to be positively correlated in the world, they are negatively correlated in people's minds (and judgments; Fischhoff et al., 1978). The significance of this finding for the affect heuristic was not realized until a study by Alhakami and Slovic (1994) found that the inverse relation between perceived risk and perceived benefit of an activity (e.g., using pesticides) was linked to the strength of positive or negative affect associated with that activity as measured by rating the activity on bipolar scales such as good/bad, nice/awful, dread/not dread, and so forth. This result implies that people base their judgments of an activity or a technology not only on what they think about it but also on how they feel about it. If their feelings toward an activity are favorable, they are moved toward judging the risks as low and the benefits as high; if their feelings toward it are unfavorable, they tend to judge the opposite—high risk and low benefit. Researchers have called this process the affect heuristic. With this model, affect comes prior to, and directs, judgments of risk and benefit, much as Zajonc proposed. This relation is hinted at in cancer research. Farrell, Murphy, and Schneider (2002) found that, although men believed that information provided about prostate cancer screening was unfavorable to getting screened, many of them cited emotional beliefs about cancer or the test (e.g., "Fear of 'The Big C'") that led them to dismiss the counseled information and conclude that the benefits of screening outweighed the risks. Most of these men intended to get screened in the future.

If a general affective view guides perceptions of risk and benefit, providing information about benefit should change perception of risk, and vice versa (see Figure 1). For example, information stating that benefit is high for a technology such as nuclear power would lead to more positive overall affect that would, in turn, decrease perceived risk (Figure 1A).

Finucane et al. (2000) conducted this experiment, providing four different kinds of information designed to manipulate affect by increasing or decreasing perceived benefit or by increasing or decreasing perceived risk for each of three technologies. The predictions were confirmed. Because by design there was no apparent logical relation between the information provided and the nonmanipulated variable, these data support the theory that risk and benefit judgments are influenced, at least in part, by the overall affective evaluation (which was influenced by the information provided). Further support for the affect heuristic came from a second experiment by Finucane et al. who found that the inverse relation between perceived risks and benefits increased greatly under time pressure, when opportunity for analytic deliberation was reduced. These two experiments are important because they demonstrate that affect influences judgment directly and is not simply a response to a prior analytic evaluation.

Judgments of Probability, Relative Frequency, and Risk

The affect heuristic has much in common with the model of risk as feelings proposed by Loewenstein, Weber, Hsee, and Welch

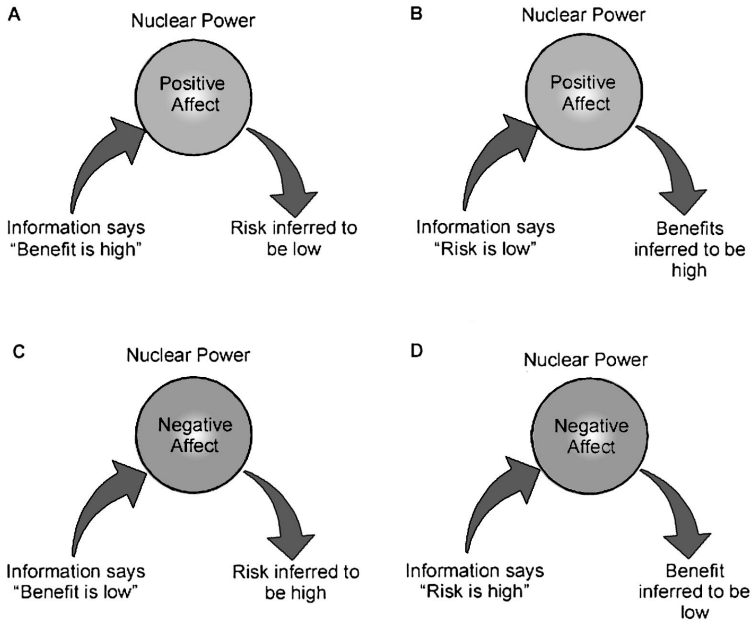

Figure 1. Model showing how information about benefit (A) or information about risk (B) could increase the positive affective evaluation of nuclear power and lead to inferences about risk and benefit that coincide affectively with the information given. Similarly, information could make the overall affective evaluation of nuclear power more negative (C and D), resulting in inferences about risk and benefit that are consistent with this more negative feeling. From "The affect heuristic in judgments of risks and benefits" by M. L. Finucane, A. Alhakami, P. Slovic, & S. M. Johnson, 2000, *Journal of Behavioral Decision Making, 13*, p. 9. Copyright John Wiley and Sons Ltd. Reprinted with permission.

(2001) and with dual-process theories put forth by Epstein (1994), Sloman (1996), Cameron & Leventhal (2003), and others. Recall that Epstein argued that individuals apprehend reality by two interactive, parallel processing systems. The *rational* system is a deliberative, analytical system that functions by way of established rules of logic and evidence (e.g., probability theory). The *experiential* system encodes reality in images, metaphors, and narratives to which affective feelings have become attached. Individuals may differ in the extent to which deliberative or experiential thinking influences risk perceptions. For example, whereas a medical professional's understanding of risk as statistical probability may be more heavily influenced by the deliberative system, lay understanding may rely on more experiential ways of knowing (Reventlow, Hvas, & Tulinius, 2001).

To demonstrate the influence of the experiential system, Denes-Raj and Epstein (1994) showed that, when offered a chance to win $1 by drawing a red jelly bean from an urn, individuals often elected to draw from a bowl containing a greater absolute number, but a smaller proportion, of red beans (e.g., 7 in 100) than from a bowl with fewer red beans but a better probability of winning (e.g., 1 in 10). These individuals reported that, although they knew the probabilities were against them, they felt they had a better chance when there were more red beans.

We can characterize Denes-Raj and Epstein's (1994) subjects as following a mental strategy of imaging the numerator (i.e., the number of red beans) and neglecting the denominator (the number of beans in the bowl). Consistent with the affect heuristic, images of winning beans convey positive affect that motivates choice.

Although the jelly bean experiment may seem frivolous, imaging the numerator brings affect to bear on judgments in ways that can be both nonintuitive and consequential. Slovic, Monahan, and MacGregor (2000) demonstrated this in a series of studies in which experienced forensic psychologists and psychiatrists were asked to judge the likelihood that a mental patient would commit an act of violence within 6 months after being discharged from the hospital. An important finding was that clinicians who were given another expert's assessment of a patient's risk of violence framed in terms of relative frequency (e.g., "of every 100 patients similar to Mr. Jones, 10 are estimated to commit an act of violence to others. . .") subsequently labeled Mr. Jones as more dangerous than did clinicians who were shown a statistically equivalent risk expressed as a probability (e.g., "Patients similar to Mr. Jones are estimated to have a 10% chance of committing an act of violence to others").

Not surprisingly, when clinicians were told that "20 out of every 100 patients similar to Mr. Jones are estimated to commit an act of violence," 41% refused to discharge the patient. However, when another group of clinicians was given the risk as "patients similar to Mr. Jones are estimated to have a 20% chance of committing an act of violence," only 21% refused to discharge the patient. Follow-up studies showed that representations of risk in the form of individual probabilities of 10% or 20% led to relatively benign images of one person, unlikely to harm anyone, whereas the equivalent frequentistic representations created frightening images of violent patients (e.g., "Some guy going crazy and killing someone"). These affect-laden images likely induced greater perceptions of risk in response to the relative frequency frames. These

results imply that (a) images of cancer as a highly dreaded disease will increase risk perceptions substantially and (b) patients told about their cancer risk in frequentistic rather than probabilistic terms will perceive even greater risk.

Although frequency formats produce affect-laden imagery, story and narrative formats may sometimes do even better in that regard. Hendrickx, Vlek, and Oppewal (1989) found that warnings were more effective when, rather than being presented in terms of relative frequencies of harm, they were presented in the form of vivid, affect-laden scenarios and anecdotes. How information is presented to patients and other decision makers may have a large impact on how they respond to risks and benefits.

Insensitivity to Probability

Most theories of decision making assume that people should, and do, pay close attention to the likelihood of important potential consequences. However, a number of factors, including reliance on the affect heuristic, can cause decision makers to neglect to consider probability (Rottenstreich & Kivetz, 2004). In other circumstances, affect can produce insensitivity to probability rather than neglect. When consequences carry sharp and strong affective meaning, as is the case with a lottery jackpot or a cancer, variation in probability often carries too little weight. As Loewenstein et al. (2001) observed, one's images and feelings toward winning the lottery are likely to be similar whether the probability of winning is 1 in 10 million or 1 in 10,000. They further noted that responses to uncertain situations appear to have an all or none characteristic that is sensitive to the possibility rather than the probability of strong positive or negative consequences, causing very small probabilities to carry great weight. This, they argued, helps explain many paradoxical findings such as the simultaneous prevalence of gambling and the purchasing of insurance (the small probabilities of winning big in the lottery and of catastrophic losses in the case of insurance are both over weighted). It also explains why societal concerns about hazards such as nuclear power and exposure to extremely small amounts of toxic chemicals fail to recede in response to information about the very small probabilities of the feared consequences from such hazards. Support for these arguments comes from Rottenstreich and Hsee (2001) who showed that, if the potential outcome of a gamble is emotionally powerful, its attractiveness or unattractiveness is relatively insensitive to changes in probability as great as from .99 to .01.

These probability–neglect results have implications for cancer communication and control. As a highly dreaded disease, cancer may act as a salient, affectively laden cue that creates insensitivity to its (often relatively low) risk. For example, Kraus, Malmfors, and Slovic (1992) found that, while expert toxicologists were sensitive to the cancer risk posed by different levels of exposure to a cancer-causing agent, the public, with stronger feelings about cancer, was more likely to believe that any level of exposure was quite risky. Statistical chances of cancer can be reduced sometimes through genetic testing and monitoring (Reyna, Lloyd, & Whalen, 2001). However, if the risk is reduced but not eliminated, the fear of cancer may remain and continue to drive high-risk perceptions despite the actual reduction of risk.

Implications for Cancer Prevention and Treatment

Researchers know that the affective and experiential nature of responses to cancer is important. Myers (2005), for example, demonstrated that affect is associated with cancer patient decisions. Specifically, he showed that affective decision factors are linked to cancer decisions such as whether to get screened for prostate cancer. Now that researchers are beginning to understand the complex interplay between emotion, affect, and reason that is wired into the human brain and is essential to rational behavior, the challenge to researchers is to think creatively about what this means for cancer prevention and treatment. Addressing this challenge is a major task, one that we can only outline briefly here.

One important direction for future research is to explore the implications of affective processes for communicating the risks and benefits of cancer prevention actions and treatment options. Variations in the way that information is framed have been found to influence the interpretation and use of that information in decisions about cancer screening and chemotherapy (e.g., Edwards, Unigwe, Elwyn, & Hood, 2003). Affective processes are certain to play a role in determining the strength and direction of such framing effects.

Consider, for example, a woman whose age and family history put her at high risk of breast cancer. Should she consider a course of preventative chemotherapy using Tamoxifen? Her Gale Score provides a numerical estimate of the probability that she will get invasive breast cancer in the next 5 years. The effect of Tamoxifen in reducing this probability can be estimated and communicated to her. Research on affect implies that the woman will perceive her risk as greater and will be more likely to opt for Tamoxifen if both her Gale Score and the reduction in likelihood of cancer are communicated as relative frequencies rather than as probabilities (a test of this hypothesis is currently underway).

Any deliberative framing of information, whether affective or not, raises ethical questions. Is it right to manipulate patients' preferences in such a way? A strong case for such manipulation is presented by Sunstein and Thaler (2003), who argued for a program of "libertarian paternalism" that acknowledges the fact that there is no neutral framing of information, thus the communication should use a format that is likely to promote the welfare of the person. However, the ultimate choice is left to the individual, following the libertarian perspective. Johnson, Steffel, and Goldstein (2005) argue the correctness of one type of framing—the use of default options—in encouraging organ donation.

Other forms of manipulation involve affective coding of information to make it more noticeable and easier to use. Such coding may involve the use of stars or other symbols to highlight important attributes of a choice or the use of affective verbal qualifiers (e.g., excellent, good) to make numerical information more "evaluable" (i.e., easier to map onto a good/bad scale; Hibbard & Peters, 2003; Hsee, 1996). This line of research suggests that numerical information about the risks and benefits of cancer prevention as well as treatment may not have much meaning or be used by patients and their families unless it makes an affective connection. Understanding how information can best be presented so that it has meaning and is used in choices will be of particular benefit in genetic counseling for cancer when patients need to understand the risks and benefits of genetic testing and any posttest decision options (Croyle & Lerman, 1999). Schwartz, Peshkin, Tercyak,

Taylor, and Valdimarsdottir (2005) reviewed evidence that use of a decision support tool that appeared to increase the evaluability of breast cancer preventative options also increased patient satisfaction and decreased their stress.

Although experiential (affective) and analytic thinking are always ongoing in what Finucane, Peters, and Slovic (2003) characterized as "the dance of affect and reason," the balance between these dual processes has been shown to be influenced by factors such as age (Peters, Finucane, MacGregor, & Slovic, 2000) and cognitive load (e.g., Shiv & Fedorikhin, 1999), both of which lead to greater reliance on affect. Ill health, stress, and time pressures are likely to do the same, as analytic thinking requires more effort and puts greater demand on attention and memory. The implications of this greater reliance on affect for decisions regarding cancer prevention and treatment are in need of study.

The Decision to Smoke Cigarettes

The leading controllable cause of cancer is cigarette smoking, which is responsible for more than 400,000 deaths annually in the United States. The harmful effects of smoking cumulate, one cigarette at a time, often over many years and hundreds of thousands of episodes. The questionable rationality of smoking decisions provides a dramatic example of the difficulty that experiential thinking faces in dealing with outcomes that change very slowly over time, are remote in time, and are visceral in nature.

For many years, beginning smokers were portrayed as "young economists," rationally weighing the risks of smoking against the benefits when deciding whether to initiate that activity (Viscusi, 1992). However, recent research paints a different picture. This new account (Slovic, 2001) shows young smokers acting experientially in the sense of giving little or no conscious thought to risks or to the amount of smoking they will be doing. Instead, they are driven by the affective impulses of the moment, enjoying smoking as something new and exciting, a way to have fun with their friends. Even after becoming "regulars," the great majority of smokers expect to stop soon, regardless of how long they have been smoking, how many cigarettes they currently smoke per day, or how many previous unsuccessful attempts they have experienced. Only a fraction actually quit, despite many attempts. The problem is nicotine addiction, a visceral condition that young smokers recognize by name as a consequence of smoking but do not understand experientially until they are caught in its grip.

The failure of the experiential system to protect many young people from the lure of smoking is nowhere more evident than in the responses to a survey question that asked smokers, "If you had it to do all over again, would you start smoking?" More than 85% of adult smokers and about 80% of young smokers (ages 14–22) answered no (Slovic, 2001). Moreover, the more individuals perceive themselves to be addicted, the more often they have tried to quit, the longer they have been smoking, and the more cigarettes they are currently smoking per day, the more likely they are to answer no to this question.

The data indicate that most beginning smokers lack the experience to appreciate how their future selves will perceive the risks from smoking or how they will value the tradeoff between health and the need to smoke. This is a strong repudiation of the model of informed rational choice. It fits well with the findings indicating that smokers give little conscious thought to risk when they begin to smoke (Slovic, 2001). They appear to be lured into the behavior by the prospects of fun and excitement. Most begin to think of risk only after starting to smoke and gaining what to them is new information about health risks.

The analysis of affect presented here also has implications for interventions to decrease cigarette smoking and to prevent its initiation (Slovic, 2003). Recent attempts by the Canadian government to decrease smoking through the use of graphic warning labels have elicited strong emotional reactions (Hammond, Fong, McDonald, Brown, & Cameron, 2004). Consistent with the affect heuristic, stronger reactions were associated with more attempts to quit or decrease smoking. Affectively salient anti-tobacco ads and warning labels also may discourage initiation. This analysis suggests the need to ban pro-tobacco advertising and promotion. Tobacco marketers have understood the importance of imagery and affect for decades. They have hired sophisticated researchers to do focus groups and surveys designed to help them understand and exploit "smoker psychology," and the results of these studies have guided marketing and promotional activities that now exceed $10 billion per year in the United States. Companies learned that it is image and affect that manipulate the behaviors of their target audiences. Thus, tobacco advertising has virtually no informational value, and what little informational content it does have (e.g., light, low tar) has been found to be misleading. Positive imagery in advertising creates the wrong impression of the smoking experience. Through the workings of the affect heuristic, this increase in positive affect likely depresses the perception of smoking risks. The repetitive exposure to smoking and cigarette brands through advertising likely creates positive affect by means of what is known as "the mere exposure effect" (Bornstein, 1989; Zajonc, 1980). As studies using subliminal images show, the influence of affective imagery is powerful, manipulative, and not under conscious control (Winkielman, Zajonc, & Schwarz, 1997). Thus, people—young and old alike—are unaware of these effects and are poorly equipped to defend against them.

Related implications are that anti-tobacco messages should be designed with the same skill and appreciation of affect that pro-tobacco messages have exhibited. In addition, promotional activities such as giving people cigarettes or clothing with brand logos and the like should be prohibited. We know that such endowments manipulate affect and preference (Knetsch, 1989).

Conclusion

It is sobering to contemplate how elusive meaning is because of its dependence on affect. One cannot assume that an intelligent person can understand the meaning of and properly act on even the simplest of numbers, not to mention more esoteric measures or statistics pertaining to risk, unless these numbers are infused with affect. Thus, the forms of information that people take for granted as meaningful, and that they expend immense effort and expense toward gathering and disseminating, may be illusory.

The scientific study of affective rationality is in its infancy. It is exciting to contemplate what might be accomplished by future research designed to help people understand the affect heuristic and use it beneficially in cancer prevention, cancer treatment, and other worthy endeavors.

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