



## Opinion Makers Section

### Affect, Reason, Risk and Rationality

by  
**Paul Slovic**  
*Decision Research*

Our understanding of the psychology of human judgment, preference and choice is continually evolving. Behavioral researchers are coming to recognize that there is an aspect of information-processing that has been rather neglected. This is the, experiential, affect-based side of our mental life, which appears every bit as important as the analytic/deliberative side that has been the focus of much prior research and the foundation for multi criteria decision analysis. This essay will briefly describe new research demonstrating the powerful influence of affect on decision-making. Reliance on affect is essential to rational behavior yet it sometimes misleads us. In such circumstances we need to ensure that reason also is employed.

#### Background and Theory: The Importance of Affect

Although the visceral emotion of fear certainly plays a role in risk as feelings, we shall focus here on a “faint whisper of emotion” called *affect*. As used here, “affect” refers to specific feelings of “goodness” or “badness” experienced with or without conscious awareness. Affect plays a central role in what have come to be known as dual-process theories of thinking. As Epstein (1994) observed,

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

Table 1 compares these two systems. 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 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. Pleasant feelings motivate actions and thoughts anticipated to reproduce the feelings. Unpleasant feelings motivate actions and thought anticipated to avoid the feelings.

Table 1. Two modes of thinking: Comparison of experiential and analytic systems. Source: Adapted from Epstein (1994).

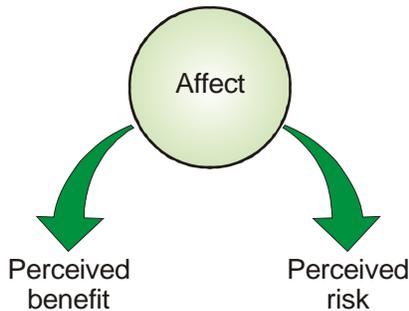
System 1 Experiential System	System 2 Analytic System
Affective: pleasure-pain oriented	Logical: reason oriented (what is sensible)
Connections by association	Connections by logical assessment
Behavior mediated by feelings from past experiences	Behavior mediated by conscious appraisal of events
Encodes reality in concrete images, metaphors, and narratives	Encodes reality in abstract symbols, words, and numbers
More rapid processing: oriented toward immediate action	Slower processing: oriented toward delayed action
Self-evidently valid: "experiencing is believing"	Requires justification via logic and evidence

There are strong elements of rationality in both systems. The experiential system 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 us 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 experiential thinking.

Studies of risk perception have demonstrated that, whereas risk and benefit tend to be positively correlated in the world, they are negatively correlated in people’s minds

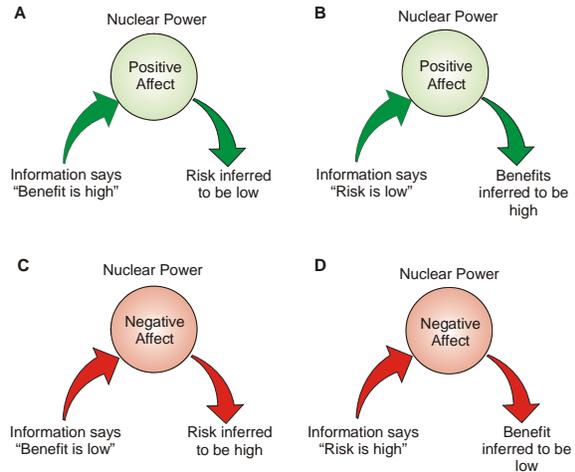
and judgments (Fischhoff et al., 1978). The significance of this finding was not realized until a study by Alhakami and Slovic (1994) found that the inverse relationship between perceived risk and perceived benefit of an activity (e.g., using pesticides) was linked to the strength of positive or negative affect associated with that activity as measured by rating the activity on bipolar scales such as *good/bad*, *nice/awful*, etc. This implies that people judge a risk not only by what they *think* about it but also by how they *feel* about it. If their feelings towards 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. Finucane, Alhakami, Slovic, & Johnson (2000) called this process "the affect heuristic" (see Figure 1).

Figure 1. A model of the affect heuristic explaining the risk/benefit confounding observed by Alhakami & Slovic (1994). Judgments of risk and benefit are assumed to be derived by reference to an overall affective evaluation of the stimulus item. Source: Finucane et al. (2000).



If affect guides perceptions of risk and benefit, then providing information about benefit should change perception of risk and vice-versa (see Figure 2). For example, information stating that benefit is high for a technology such as nuclear power should lead to more positive overall affect which should, in turn, decrease perceived risk (Figure 2A).

Figure 2. 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 as in C and D, resulting in inferences about risk and benefit that are consistent with this more negative feeling. Support for this model was found by Finucane et al. (2000).



Finucane et al. (2000) tested the predictions outlined in Figure 2, providing four different kinds of information designed to manipulate affect by increasing or decreasing perceived benefit or by increasing or decreasing perceived risk. This was done for each of three technologies. The predictions were confirmed. Further support for the affect heuristic came from a second experiment by Finucane et al. who found that the inverse relationship between perceived risks and benefits increased greatly under time pressure, when opportunity for analytic deliberation was reduced. These two experiments demonstrate that affect influences judgment directly and is not simply a response to a prior analytic evaluation.

**Failures of the Experiential System**

The affect heuristic has been portrayed as the centerpiece of the experiential mode of thinking, the dominant mode of risk assessment and survival during the evolution of the human species. However, like other heuristics that provide efficient and generally adaptive responses but occasionally get us into trouble, reliance on affect can also mislead us, as will be shown below. Indeed, if it were always optimal to follow our affective and experiential instincts, there would have been no need for the rational/analytic system of thinking to have evolved and become so prominent in human affairs.

**Judgments of Probability, Relative Frequency, and Risk**

The *experiential* system of thinking encodes reality in images, metaphors, and narratives to which affective feelings have become attached. To demonstrate this system, Denes-Raj and Epstein (1994) showed that, when offered a chance to win \$1.00 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 Epstein's 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 non-intuitive and consequential. Slovic, Monahan, and MacGregor (2000) demonstrated this by asking experienced forensic psychologists and psychiatrists to judge the likelihood that a hospitalized mental patient would commit an act of violence within 6 months after being discharged from the facility. 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. But 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" frequentist representations created frightening images of violent patients (example: "Some guy going crazy and killing someone"). These affect-laden images likely induced greater perceptions of risk in response to the relative-frequency frames.

### ***Insensitivity to Probability (Probability Neglect)***

When the consequences of an action or event carry strong affective meaning, as is the case with a lottery jackpot or a cancer, the probability of such consequences often carries too little weight. As Loewenstein, Weber, Hsee, & Welch (2001) observe, one's images and feelings toward winning the lottery are likely to be similar whether the probability of winning is one in ten million or one in ten thousand. They further note 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. Empirical

support for these arguments comes from Rottenstreich and Hsee (2001) who show that, if the potential outcome evokes strong positive or negative affect, its attractiveness or unattractiveness is relatively insensitive to changes in probability as great as from .99 to .01.

Legal scholar Cass Sunstein (2003; p. 122) labels this insensitivity probability neglect and argues that this phenomenon causes extreme overreaction to terrorist threats by both public officials and private citizens.

[P]eople are prone to ... *probability neglect*, especially when their emotions are intensely engaged. Probability neglect is highly likely in the aftermath of terrorism...When probability neglect is at work, people's attention is focused on the bad outcome itself, and they are inattentive to the fact that it is unlikely to occur.

### **Managing Affect, Reason, and Risk**

Affect misguides us in many important ways resulting from the natural limitations of the experiential system and the existence of stimuli in the environment that are simply not amenable to valid affective representation. We have seen above the way that perceptions of risk can be confused by positive feelings (e.g., benefits). Risk perceptions and decision making can also be inappropriate when the *presence of strong affect* leads us to be insensitive to probabilities. Moreover, the affective system seems designed to sensitize us to small changes in our environment (e.g., the difference between 0 and 1 deaths) at the cost of making us less able to appreciate and respond appropriately to larger changes further away from zero (e.g., the difference between 87 deaths and 88 deaths). Fetherstonhaugh et al. (1997) referred to this insensitivity as "psychophysical numbing." Nobel-prize winning biochemist Albert Szent-Gyorgi put it another way as he struggled to comprehend the enormity of the consequences of nuclear war: "I am deeply moved if I see one man suffering and would risk my life for him. Then I talk impersonally about the possible pulverization of our big cities, with a hundred million dead. I am unable to multiply one man's suffering by a hundred million."

Now that we are beginning to understand the complex interplay between emotion, affect, and reason that is wired into the human brain and essential to rational behavior, the challenge before us is to think creatively about what this means for managing risk and making good decisions. On the one hand, how do we apply reason to temper the strong emotions engendered by some risk events? On the other hand, how do we infuse needed "doses of feeling" into circumstances where lack of experience may otherwise leave us too "coldly rational?"

### ***Can Generation of Reasons Degrade Decision Quality?***

Daniel Kahneman (2003) in his Nobel Prize Address argues that highly accessible impressions produced by the experiential system (he calls it System 1) control judgments and decisions, unless modified or overridden by the deliberate operations of the analytic system (called System 2). This suggests that deliberative, reason-based analysis generally will improve decision quality. This view also implies that errors of intuitive judgment involve failures of both systems—System 1, which generates the error, and System 2, which fails to detect and correct it. The corrective operations of System 2 may be impaired by time pressure (Finucane et al., 2000), by cognitive load (Shiv & Federikhan, 1999; Gilbert, 2002), by stress, by age, or by individual cognitive limitations (Peters et al., 2005).

But what happens when System 2 is brought into play early, as when an individual is asked to generate reasons to support a judgment or decision? Research by Wilson and colleagues demonstrates that, when affect is important, an attempt by the decision maker to provide reasons might sometimes produce an inferior decision by interfering with the affective feelings (Epstein, 1994; see Table 1) that subsequently determine how we will experience the consequences of the decision (Wilson & Schooler, 1991; Wilson, Lisle, Schooler, Hodges, Klaaren, & LaFleur, 1993). For example, Wilson et al. found that people who gave numerous reasons for liking an art poster prior to choosing it were subsequently less satisfied with it than those who chose without explicitly considering reasons. Similar degrading of decision performance due to introspection is reported by Tordesillas and Chaiken (1999). Could this pose problems for decision analysis, which depends heavily on introspective judgments?

### ***Can Analysis Benefit from Experiential Thinking?***

The answer to this question is almost certainly yes. Even such prototypical analytic exercises as proving a mathematical theorem or selecting a move in chess benefit from experiential guidance. The mathematician senses whether the proof "looks good" and the chessmaster gauges whether a contemplated move "feels right," based upon stored knowledge of a large number of winning patterns (de Groot, 1978). Analysts attempting to build a model to solve a client's decision-making problem are instructed to rely upon the client's sense of unease about the results of the current model as a signal that further modeling may be needed (Phillips, 1984). A striking example of failure because an analysis was devoid of feeling was perpetrated by Philip Morris. The company commissioned an analysis of the costs to the Czech government of treating diseased smokers. Employing a very narrow conception of costs, the analysis concluded that smokers benefited the government by dying young.

The analysis created so much hostility that Philip Morris was forced to issue an apology ("Philip Morris," 2001). Another example of the need to respect "experiential wisdom" comes from the inquiry into the causes of the Columbia Space Shuttle disaster, which pointed to the failure of NASA's risk assessment protocols to give weight to the worries and hunches of personnel who had observed suspicious damage to heat-shielding tiles on previous flights. An article in *Aviation Week* asserted that lack of hard data prevented the input of common sense analysis into the risk-assessment process (Covault, 2003).

Elsewhere I have argued that risk analysis needs to be sensitive to the "softer" values underlying such qualities as dread, equity, controllability, etc. that underlie people's concerns, as well as to degrees of ignorance or scientific uncertainty (Slovic, 1987; 2000). A blueprint for doing this is sketched in the National Academy of Sciences report *Understanding Risk: Decision Making in a Democratic Society* (National Research Council, 1996).

### **Conclusion**

Reliance on affect is a sophisticated cognitive mechanism that helps us to respond quickly and effectively in many decision situations. In other circumstances, affect may lead us to judge probabilities and consequences and make decisions in ways that are not beneficial. We need to understand the circumstances in which affect improves our decision making and the circumstances in which it leads us astray. Additional research on affect and decision making will be essential to this understanding.

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