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What's Fear Got to Do with It? It's Affect We Need to Worry About

Paul Slovic*

My objective in this paper is to provide a psychological perspective on the challenges to rational decision making in the face of terrorism and other risk crises. I shall begin with an introduction to the psychology of risk, highlighting the role of affect and its contribution to what may be called “risk as feelings.” I shall then address the need to educate and inform citizens about risks from terrorism and some of the particular challenges this entails.

The importance of this topic for democratic societies can hardly be overestimated. Australian sociologist Michael Humphrey writes that, in the West, the state’s preoccupation with risk from terrorism neglects the complex nature of crises associated with poverty, disease, hunger, and global warming, increasing the vulnerability of the poorest and weakest members of society.¹ One problem with this risk preoccupation, argues Humphrey, is that it lacks vision.² It focuses upon endings, disasters, things that may go wrong—not new beginnings. Imagined social futures and solutions are overshadowed by imagined apocalypses. Perhaps by understanding the psychology of risk, we can achieve more balanced and effective policies for dealing with risk crises.

I. RISK AS FEELINGS: THE IMPORTANCE OF AFFECT

The scientific approach to risk, *risk as analysis*, brings logic, reason, and scientific argument to bear on hazard management. In contrast, *risk as feelings* refers to our fast, instinctive, and intuitive reactions to danger.

Although the visceral emotion of fear certainly plays a role in risk as feelings, I shall focus here on a “faint whisper of emotion” called *affect*. As used here, “affect” means the specific quality of “goodness” or “badness” (i) experienced as a feeling state (with or without consciousness) and (ii) demarcating the 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.” Reliance on such feelings can be characterized as “the affect heuristic.” In this Section, I shall trace the development of the affect heuristic across a variety of research paths

* This paper draws extensively on material presented in a chapter titled *The Affect Heuristic*, co-authored with Melissa Finucane, Ellen Peters, and Donald MacGregor, appearing in *HEURISTICS AND BIASES: THE PSYCHOLOGY OF INTUITIVE JUDGMENT* 397-420 (Thomas Gilovich, D. Griffin, & D. Kahneman eds., 2002).

1. Michael Humphrey, Conference on Risk, Complex Crises and Social Futures (2003) (unpublished proposal).

2. *Id.*

followed by ourselves and many others. I shall also discuss some of the important practical implications resulting from ways that this heuristic impacts our perception and evaluation of risk and, more generally, the way it affects all human decision making.

A. Two Modes of Thinking

Affect plays a central role in what have come to be known as dual-process theories of thinking, knowing, and information processing.³ As Seymour Epstein observed, “there is no dearth of evidence in everyday life 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.”⁴ Table 1, adapted from Epstein,⁵ further compares these modes of thought.

Table 1. *Two Modes of Thinking: Comparison of the Experiential and Analytic Systems*

Experiential system	Analytic system
1. Holistic	1. Analytic
2. Affective: Pleasure-pain oriented	2. Logical: Reason oriented (what is sensible)
3. Associationistic connections	3. Logical connections
4. Behavior mediated by “vibes” from past experiences	4. Behavior mediated by conscious appraisal of events
5. Encodes reality in concrete images, metaphors, and narratives	5. Encodes reality in abstract symbols, words, and numbers
6. More rapid processing: Oriented toward immediate action	6. Slower processing: Oriented toward delayed action
7. Self-evidently valid: “experiencing is believing”	7. Requires justification via logic and evidence

3. See DUAL-PROCESS THEORIES IN SOCIAL PSYCHOLOGY (Shelly Chaiken & Yaacov Trope eds., 1999); Daniel Kahneman & Shane Frederick, *Representativeness Revisited: Attribute Substitution in Intuitive Judgment*, in HEURISTICS AND BIASES: THE PSYCHOLOGY OF INTUITIVE JUDGMENT 49 (Thomas Gilovich et al. eds., 2002); Steven A. Sloman, *The Empirical Case for Two Systems of Reasoning*, 119 PSYCHOL. BULL. 3 (1996).

4. Seymour Epstein, *Integration of the Cognitive and the Psychodynamic Unconscious*, 49 AM. PSYCHOLOGIST 709, 710 (1994).

5. *Id.* at 711 tbl. 1.

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.⁶ Epstein's view on this is as follows:

The experiential system is assumed to be intimately associated with the experience of affect, . . . which refer[s] to subtle feelings of which people are often unaware. When a person responds to an emotionally significant event . . . [t]he experiential system automatically searches its memory banks for related events, including their emotional accompaniments. . . . If the activated feelings are pleasant, they motivate actions and thoughts anticipated to reproduce the feelings. If the feelings are unpleasant, they motivate actions and thoughts anticipated to avoid the feelings.⁷

Whereas Epstein labeled the right side of Table 1 the "rational system,"⁸ my colleagues and I have renamed it the "analytic system," in recognition that there are strong elements of rationality in both systems.⁹ 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, or 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 our experiential thinking. Subsequently, analytic thinking was placed on a pedestal and portrayed as the epitome of rationality. Affect and emotion were seen as interfering with reason.

As the study of cognition has advanced, however, decision researchers have increasingly recognized the importance of affect. Zajonc, a strong, early

6. See generally AFFECT AND COGNITION (Margaret Sydnor Clark & Susan T. Fiske eds., 1982); FEELING AND THINKING: THE ROLE OF AFFECT IN SOCIAL COGNITION (Joseph P. Forgas ed., 2000); JOSEPH LEDOUX, THE EMOTIONAL BRAIN: THE MYSTERIOUS UNDERPINNINGS OF EMOTIONAL LIFE (1996); ORVAL HOBART MOWRER, LEARNING THEORY AND BEHAVIOR (1960); 1 SILVAN S. TOMKINS, AFFECT, IMAGERY, AND CONSCIOUSNESS: THE POSITIVE AFFECTS (1962); 2 SILVAN S. TOMKINS, AFFECT, IMAGERY, AND CONSCIOUSNESS: THE NEGATIVE AFFECTS (1963); THE WISDOM IN FEELING: PSYCHOLOGICAL PROCESSES IN EMOTIONAL INTELLIGENCE (Lisa Feldman Barrett & Peter Salovey eds., 2002); R.B. Zajonc, *Feeling and Thinking: Preferences Need No Inferences*, 35 AM. PSYCHOLOGIST 151 (1980).

7. Epstein, *supra* note 4, at 716.

8. *Id.* at 711 tbl 1.

9. Paul Slovic et al., *The Affect Heuristic*, in HEURISTICS AND BIASES: THE PSYCHOLOGY OF INTUITIVE JUDGMENT, *supra* note 3, at 397.

proponent of the importance of affect in decision making, argued that affective reactions to stimuli are often the very first reactions, occurring automatically and subsequently guiding information processing and judgment.¹⁰ If Zajonc is correct, then affective reactions may serve as orienting mechanisms, helping us navigate quickly and efficiently through a complex, uncertain, and sometimes dangerous world.¹¹

One of the most comprehensive and dramatic theoretical accounts of the role of affect and emotion in decision making was presented by the neurologist Antonio Damasio.¹² In seeking to determine “[w]hat in the brain allows humans to behave rationally,”¹³ Damasio argued that thought is made largely from images, broadly construed to include perceptual and symbolic representations.¹⁴ A lifetime of learning “marks” these images with positive and negative feelings linked directly or indirectly to somatic or bodily states.¹⁵ When a negative somatic marker is linked to an image of a future outcome, it sounds an alarm.¹⁶ When a positive marker is associated with the outcome image, “it becomes a beacon of incentive.”¹⁷ Damasio hypothesized that somatic markers increase the accuracy and efficiency of the decision process; and their

10. See Zajonc, *supra* note 6.

11. For other important work on affect and decision making, see IRVING L. JANIS & LEON MANN, *DECISION MAKING: A PSYCHOLOGICAL ANALYSIS OF CONFLICT, CHOICE, AND COMMITMENT* (1977); Alice M. Isen, *Positive Affect and Decision Making*, in *HANDBOOK OF EMOTIONS* 261 (Michael Lewis & Jeannette M. Haviland eds., 1993); Eric J. Johnson & Amos Tversky, *Affect, Generalization, and the Perception of Risk*, 45 *J. PERSONALITY & SOC. PSYCHOL.* 20 (1983); Daniel Kahneman & Jackie Snell, *Predicting Utility*, in *INSIGHTS IN DECISION MAKING* 295 (Robin M. Hogarth ed., 1990); Daniel Kahneman et al., *Shared Outrage and Erratic Awards: The Psychology of Punitive Damages*, 16 *J. RISK & UNCERTAINTY* 49 (1998); George Loewenstein, *Out of Control: Visceral Influences on Behavior*, 65 *ORGANIZATIONAL BEHAV. & HUM. DECISION PROCESSES* 272 (1996); George F. Loewenstein et al., *Risk as Feelings*, 127 *PSYCHOL. BULL.* 267 (2001); Barbara A. Mellers, *Choice and the Relative Pleasure of Consequences*, 126 *PSYCHOL. BULL.* 910 (2000); Barbara A. Mellers et al., *Decision Affect Theory: Emotional Reactions to the Outcomes of Risky Options*, 8 *PSYCHOL. SCI.* 423 (1997); Yuval Rottenstreich & Christopher K. Hsee, *Money, Kisses and Electric Shocks: On the Affective Psychology of Risk*, 12 *PSYCHOL. SCI.* 185 (2001); Paul Rozin et al., *Disgust*, in *HANDBOOK OF EMOTIONS*, *supra*, at 575; Norbert Schwarz & Gerald L. Clore, *How Do I Feel About It? The Informative Function of Affective States*, in *AFFECT, COGNITION AND SOCIAL BEHAVIOR* 44 (Klaus Fiedler & Joseph Forgas eds., 1988); Slovic et al., *supra* note 9; Timothy D. Wilson et al., *Introspecting About Reasons Can Reduce Post-choice Satisfaction*, 19 *PERSONALITY & SOC. PSYCHOL. BULL.* 331 (1993).

12. ANTONIO R. DAMASIO, *DESCARTES' ERROR: EMOTION, REASON, AND THE HUMAN BRAIN* (1994).

13. *Id.* at 85.

14. *Id.* at 106-08.

15. *Id.* at 173-75.

16. *Id.* at 174.

17. *Id.*

absence, observed in people with certain types of brain damage, degrades decision performance.¹⁸

We now recognize that the experiential mode of thinking and the analytic mode of thinking are continually active, interacting in what we have characterized as “the dance of affect and reason.”¹⁹ While we may be able to “do the right thing” without analysis (e.g., dodge a falling object), it is unlikely that we can employ analytic thinking rationally without guidance from affect somewhere along the line. Affect is essential to rational action. As Damasio observes:

The strategies of human reason probably did not develop, in either evolution or any single individual, without the guiding force of the mechanisms of biological regulation, of which emotion and feeling are notable expressions. Moreover, even after reasoning strategies become established . . . their effective deployment probably depends, to a considerable extent, on a continued ability to experience feelings.²⁰

B. The Affect Heuristic

The feelings that become salient in a judgment or decision-making process depend on 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 upon experiential thinking.²¹ As I will show in this paper, tasks 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.

The mapping of affective information determines the contributions stimulus images make to an individual’s “affect pool.” All of the images in people’s minds are tagged or marked to varying degrees with affect. The affect pool contains all the positive and negative markers associated (consciously or unconsciously) with the images. The intensity of the markers varies with the images.

18. *Id.* at 173-80.

19. Melissa L. Finucane et al., *Judgment and Decision Making: The Dance of Affect and Reason*, in EMERGING PERSPECTIVES ON JUDGMENT AND DECISION RESEARCH 327 (Sandra L. Schneider & James Shanteau eds., 2003).

20. DAMASIO, *supra* note 12, at xii.

21. See Karen Gasper & Gerald L. Clore, *The Persistent Use of Negative Affect by Anxious Individuals to Estimate Risk*, 74 J. PERSONALITY & SOC. PSYCHOL. 1350 (1998); Ellen Peters & Paul Slovic, *The Springs of Action: Affective and Analytical Information Processing in Choice*, 26 PERSONALITY & SOC. PSYCHOL. BULL. 1465 (2000).

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),²² 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 short-cut has led to labeling the use of affect a “heuristic.”²³

II. EMPIRICAL SUPPORT FOR THE AFFECT HEURISTIC

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

A. 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.²⁴ 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, noting that dread was also associated with factors such as voluntariness, controllability, lethality, and fairness, incorporated these qualities into his “outrage model.”²⁵ 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).²⁶

B. Risk and Benefit Judgments

The earliest studies of risk perception also found that even though risk and benefit tend to be positively correlated in the world, they are negatively

22. See JUDGMENT UNDER UNCERTAINTY: HEURISTICS AND BIASES (Daniel Kahneman et al. eds., 1982).

23. See Melissa L. Finucane et al., *The Affect Heuristic in Judgments of Risks and Benefits*, 13 J. BEHAV. DECISION MAKING 1 (2000); Slovic et al., *supra* note 9.

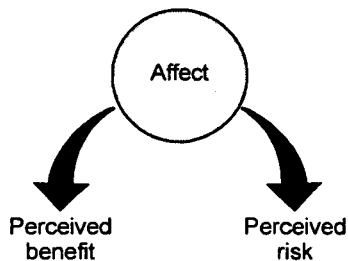
24. See Baruch Fischhoff et al., *How Safe Is Safe Enough? A Psychometric Study of Attitudes Toward Technological Risks and Benefits*, 9 POL’Y SCI. 127 (1978); Paul Slovic, *Perception of Risk*, 236 SCIENCE 280 (1987).

25. See Peter Sandman, *Hazard Versus Outrage in the Public Perception of Risk*, in EFFECTIVE RISK COMMUNICATION: THE ROLE AND RESPONSIBILITY OF GOVERNMENT AND NONGOVERNMENT ORGANIZATIONS 45 (Vincent T. Covello et al. eds., 1989).

26. *Id.*

correlated in people's minds (and judgments).²⁷ The significance of this finding for the affect heuristic was not realized until a study by Alhakami and Slovic 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*, *dreaded/not dreaded*, and so forth.²⁸ 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. Under this model, affect comes prior to, and directs, judgments of risk and benefit, much as Zajonc proposed. This process, which we have called “the affect heuristic” (see Figure 1), suggests that, 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 2). For example, information stating that benefit is high for a technology such as nuclear power would lead to more positive overall affect which would, in turn, decrease perceived risk (Figure 2A).

Figure 1. A model of the affect heuristic explaining the risk/benefit confounding observed by Alhakami and Slovic.²⁹ Judgments of risk and benefit are assumed to be derived by reference to an overall affective evaluation of the stimulus item.³⁰



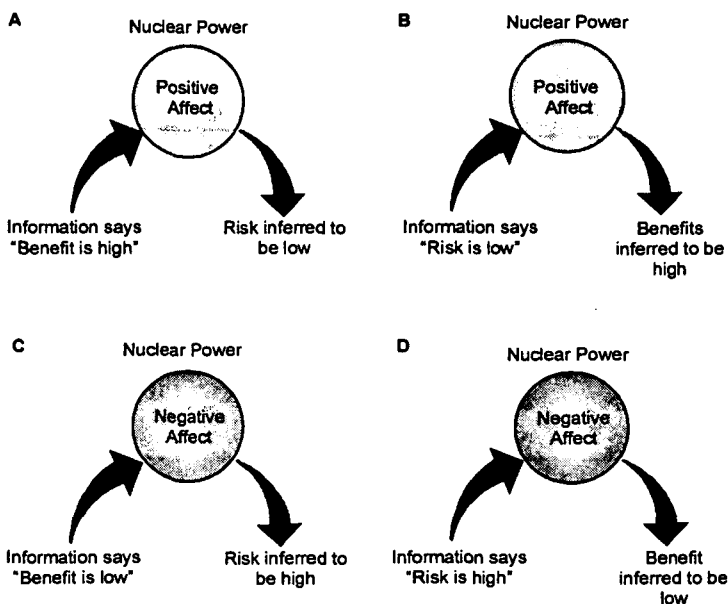
27. Fischhoff et al., *supra* note 24.

28. Ali Siddiq Alhakami & Paul Slovic, *A Psychological Study of the Inverse Relationship Between Perceived Risk and Perceived Benefit*, 14 RISK ANALYSIS 1085 (1994).

29. *See id.*

30. Finucane et al., *supra* note 23, at 4.

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.³¹



Finucane et al. 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.³² The predictions were confirmed.³³ Because by design there was no apparent logical relationship 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. finding that the inverse relationship between perceived risks and benefits increased greatly under time pressure, when opportunity for analytic deliberation was reduced.³⁴ These two experiments are important because they demonstrate

31. *Id.* at 9.

32. *Id.* at 9-11.

33. *Id.* at 13.

34. *Id.* at 5-8.

that affect influences judgment directly and is not simply a response to a prior analytic evaluation.

Further support for the model in Figure 1 has come from two very different domains—toxicology and finance. Slovic, MacGregor, Malmfors, and Purchase surveyed members of the British Toxicological Society and found that these experts, too, produced the same inverse relation between their risk and benefit judgments.³⁵ As expected, the strength of the inverse relation was found to be mediated by the toxicologists' affective reactions toward the hazard items being judged.³⁶ In a second study, these same toxicologists were asked to make a "quick intuitive rating" for each of thirty chemical items (e.g., benzene, aspirin, second-hand cigarette smoke, dioxin in food) on an affect scale (bad-good).³⁷ Next, they were asked to judge the degree of risk associated with a very small exposure to the chemical, defined as an exposure that is less than 1/100 the exposure level that would begin to cause concern for a regulatory agency.³⁸ Because exposure was so low, one might rationally expect these risk judgments to be uniformly low and unvarying, resulting in little or no correlation with the ratings of affect. Instead, there was a strong correlation across chemicals between affect and judged risk of a very small exposure.³⁹ When the affect rating was strongly negative, judged risk of a very small exposure was high; when affect was positive, judged risk was small.⁴⁰ Almost every respondent (95 out of 97) showed this negative correlation (the median correlation was $-.50$).⁴¹ Importantly, those toxicologists who produced strong inverse correlations between risk and benefit judgments in the first study were also more likely to exhibit a high correspondence between their judgments of affect and risk in the second study.⁴² In other words, across two different tasks, reliable individual differences emerged in the toxicologists' reliance on affective processes in judgments of chemical risks.

In the realm of finance, Ganzach found support for a model in which analysts base their judgments of risk and return for unfamiliar stocks upon a global attitude.⁴³ If stocks were perceived as good, they were judged to have high return and low risk, whereas if they were perceived as bad, they were judged to be low in return and high in risk.⁴⁴ However, for familiar stocks,

35. Paul Slovic et al., Influence of Affective Processes on Toxicologists' Judgments of Risk (unpublished, on file with author).

36. *Id.*

37. *Id.*

38. *Id.*

39. *Id.*

40. *Id.*

41. *Id.*

42. *Id.*

43. Yoav Ganzach, *Judging Risk and Return of Financial Assets*, 83 ORGANIZATIONAL BEHAV. & HUM. DECISION PROCESSES 353 (2000).

44. *Id.* at 355-56.

perceived risk and return were positively correlated, rather than being driven by a global attitude.⁴⁵

C. Judgments of Probability, Relative Frequency, and Risk

The affect heuristic has much in common with the model of “risk as feelings” proposed by Loewenstein et al.⁴⁶ and with dual-process theories put forth by Epstein,⁴⁷ Sloman,⁴⁸ and others. Recall that Epstein argues that individuals apprehend reality by two interactive, parallel processing systems.⁴⁹ The *rational* system is a deliberative, analytical system that functions by way of established rules of logic and evidence (e.g., probability theory).⁵⁰ The *experiential* system encodes reality in images, metaphors, and narratives to which affective feelings have become attached.⁵¹

To demonstrate the influence of the experiential system, Denes-Raj and Epstein showed that, when offered a chance to win a dollar by drawing a red jelly bean from a bowl, 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).⁵² 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.⁵³

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 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 six months after being discharged from the

45. *Id.* at 356-57.

46. Loewenstein et al., *supra* note 11.

47. Epstein, *supra* note 4.

48. Sloman, *supra* note 3.

49. Epstein, *supra* note 4.

50. *Id.*

51. *Id.*

52. Veronika Denes-Raj & Seymour Epstein, *Conflict Between Intuitive and Rational Processing: When People Behave Against Their Better Judgment*, 66 J. PERSONALITY & SOC. PSYCHOL. 819, 822 (1994).

53. *Id.* at 823.

hospital.⁵⁴ The studies showed 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 percent chance of committing an act of violence to others . . .").⁵⁵

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 percent would refuse to discharge the patient.⁵⁶ But when another group of clinicians was given the risk as "Patients similar to Mr. Jones are estimated to have a 20 percent chance of committing an act of violence," only 21 percent would refuse to discharge the patient.⁵⁷ Similar results have been found by Yamagishi, whose subjects rated a disease that kills 1,286 people out of every 10,000 as more as more dangerous than one that kills 24.14 percent of the population.⁵⁸

Follow-up studies showed that representations of risk in the form of individual probabilities of 10 percent or 20 percent 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.

Although frequency formats produce affect-laden imagery, story and narrative formats appear to do even better in that regard. Hendrickx, Vlek, and Oppewal 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.⁵⁹ Sanfey and Hastie found that compared with respondents given information in bar graphs or data tables, respondents given narrative information more accurately estimated the

54. See Paul Slovic et al., *Violence Risk Assessment and Risk Communication: The Effects of Using Actual Cases, Providing Instructions, and Employing Probability vs. Frequency Formats*, 24 LAW & HUM. BEHAV. 271 (2000).

55. *Id.* at 284-89.

56. *Id.* at 288.

57. *Id.*

58. Kimihiko Yamagishi, *When a 12.86% Mortality Is More Dangerous Than 24.14%: Implications for Risk Communication*, 11 APPLIED COGNITIVE PSYCHOL. 495 (1997).

59. Laurie Hendrickx et al., *Relative Importance of Scenario Information and Frequency Information in the Judgment of Risk*, 72 ACTA PSYCHOLOGICA 41 (1989).

performance of a set of marathon runners.⁶⁰ Furthermore, Pennington and Hastie found that jurors construct narrative-like summations of trial evidence to help them process their judgments of guilt or innocence.⁶¹

Perhaps the biases in probability and frequency judgment that have been attributed to the availability heuristic⁶² may be due, at least in part, to affect. Availability may work not only through ease of recall or imaginability, but because remembered and imagined images come tagged with affect. For example, Lichtenstein, Slovic, Fischhoff, Layman, and Combs invoked availability to explain why judged frequencies of highly publicized causes of death (e.g., accidents, homicides, fires, tornadoes, and cancer) were relatively overestimated while underpublicized causes (e.g., diabetes, stroke, asthma, tuberculosis) were underestimated.⁶³ The highly publicized causes appear to be more affectively charged, that is, more sensational, and this may account both for their prominence in the media and their relatively overestimated frequencies.

D. Insensitivity to Probability (Probability Neglect)

When the consequences of an action or event carry sharp and 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 et al. 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.⁶⁴ 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.⁶⁵ This, they argue, helps explain many paradoxical findings such as the simultaneous prevalence of gambling and the purchasing of insurance.⁶⁶ 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. Sup-

60. Alan Sanfey & Reid Hastie, *Does Evidence Presentation Format Affect Judgment? An Experimental Evaluation of Displays of Data for Judgments*, 9 PSYCHOL. SCI. 99 (1998).

61. Nancy Pennington & Reid Hastie, *A Theory of Explanation-based Decision Making*, in DECISION MAKING IN ACTION: MODELS AND METHODS 188 (Gary Klein et al. eds., 1993).

62. See Amos Tversky & Daniel Kahneman, *Availability: A Heuristic for Judging Frequency and Probability*, 5 COGNITIVE PSYCHOL. 207 (1973).

63. Sarah Lichtenstein et al., *Judged Frequency of Lethal Events*, 4 J. EXPERIMENTAL PSYCHOL.: HUM. LEARNING & MEMORY 551 (1978).

64. Loewenstein et al., *supra* note 11, at 276.

65. *Id.*

66. *Id.* at 277.

port for these arguments comes from Rottenstreich and Hsee who show 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 .01.⁶⁷

III. FAILURES OF THE EXPERIENTIAL SYSTEM

Throughout this paper, I have portrayed the affect heuristic as the centerpiece of the experiential mode of thinking, the dominant mode of risk assessment and survival during the evolution of the human species. But, like other heuristics that provide efficient and generally adaptive responses while occasionally getting us into trouble, affect can also mislead us. 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 to have become so prominent in human affairs.

There are two important ways that experiential thinking misguides us. One results from the deliberate manipulation of our affective reactions by those who wish to control our behaviors. (Advertising and marketing exemplify this manipulation.) The other results from the natural limitations of the experiential system and the existence of stimuli in our environment that are simply not amenable to valid affective representation. The latter problem is discussed below.

Judgments and decisions can be faulty not only because their affective components are manipulable, but also because they are subject to inherent biases of the experiential system. For example, the affective system seems designed to sensitize us to small changes in our environment (e.g., the difference between zero deaths and one death) 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 500 deaths and 600 deaths). Fetherstonhaugh, Slovic, Johnson, and Friedrich referred to this insensitivity as “psychophysical numbing.”⁶⁸ Albert Szent-Gyorgi put it another way: “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.”⁶⁹

Similar problems arise when the outcomes that we must evaluate are visceral in nature. Visceral factors include drive states such as hunger, thirst, sexual desire, emotions, pain, and drug craving. They have direct, hedonic impacts on behavior. Although they produce strong feelings in the present moment, these feelings are difficult if not impossible to recall or anticipate in

67. Rottenstreich & Hsee, *supra* note 11.

68. David Fetherstonhaugh et al., *Insensitivity to the Value of Human Life: A Study of Psychophysical Numbing*, 14 J. RISK & UNCERTAINTY 283 (1997).

69. *Id.* at 283 (quoting Nobel laureate Albert Szent-Gyorgi).

a veridical manner, a factor that plays a key role in the phenomenon of addiction:⁷⁰

Unlike currently experienced visceral factors, which have a disproportionate impact on behavior, delayed visceral factors tend to be ignored or severely underweighted in decision making. Today's pain, hunger, anger, etc. are palpable, but the same sensations anticipated in the future receive little weight.⁷¹

IV. A DIFFICULT BALANCE: RISK PERCEPTION AND COMMUNICATION IN AN AGE OF TERRORISM

There are two interpretations of the term "a difficult balance" in the title of this Section. First, there is a difficult balance between alerting and informing people about serious risks and creating exaggerated and harmful fears. Secondly, there is a difficult balance between assessing terrorism risks analytically and assessing such risks emotionally and affectively.

Building on our knowledge of risk as feelings, the remainder of this paper will examine these balancing acts in view of the potential crises posed by terrorist acts. Specifically, I will consider:

- the difficulties in rationally assessing risks from terrorism,
- the circumstances under which cognitive distortions affect terrorism risk perception,
- the factors affecting the way individuals think about their lives and their futures in a world beset by terrorist acts, and
- the effect that feeling vulnerable to terrorism has on behavior and mental health.

This inquiry will lead to a more general question: How can we best educate and communicate with the public regarding the risks of terrorism?

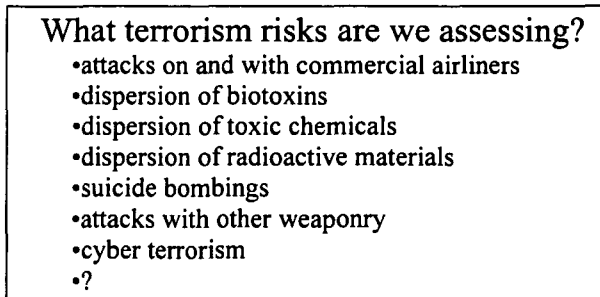
A. Scoping the Problem

Let us first take a broad look at the problem. We see that risk communication depends greatly upon both technical assessments of risk and processes of risk perception. However, the first of these factors, risk assessment, poses major difficulties. For example, there are myriad forms of terrorism (Figure 3).

70. See George Loewenstein, *A Visceral Account of Addiction*, in GETTING HOOKED: RATIONALITY AND ADDICTION 235 (Jon Elster & Ole-Jorgen Skog eds., 1999); Paul Slovic, *Cigarette Smokers: Rational Actors or Rational Fools?*, in SMOKING: RISK, PERCEPTION, & POLICY 97 (Paul Slovic ed., 2001).

71. Loewenstein, *supra* note 70, at 240.

Figure 3. Risk assessment for terrorism.



Many of these are relatively new, and we lack information necessary to inform risk assessment. Our understanding and models of “terrorists’ minds” are also too crude to permit precise predictions of where, when, and how the next attacks might unfold. This “new species of trouble”⁷² strains the capacity of quantitative risk analysis and thus limits what can be communicated. Because the role and capability of risk assessment are diminished when the uncertainties are so enormous, understanding risk perception is essential to effective education and communication. There are several key questions:

- What does the public want to know?
- What does the public need to know?
- What useful information do we have to communicate?
- What public misconceptions can be corrected?
- How can public fears and anxieties be kept in balance?

B. Perception of Risk

Risk perception has been studied extensively during the past thirty years.⁷³ Among other discoveries, we have found that every hazard has a unique profile of qualities (much like a personality profile) that influences perception and acceptance of its risk. For example, nuclear power and x-rays, two radiation hazards, have very different perception profiles. Most people see nuclear power risks as greater and less acceptable than the risks from x-rays. Terrorism hits all the same “risk perception hot buttons” as nuclear power, only it does so intentionally. It has vivid and dreadful consequences; exposure is involuntary and difficult to control (or avoid); and it is unfamiliar, often catastrophic, and caused by human malevolence. Philip Zimbardo, recent President of the American Psychological Association, characterizes it well:

72. KAI ERIKSON, *A NEW SPECIES OF TROUBLE: EXPLORATIONS IN DISASTER, TRAUMA, AND COMMUNITY* (1994).

73. PAUL SLOVIC, *THE PERCEPTION OF RISK* (2000).

Terrorism is about psychology. It is about taking strategic actions that incite terror and fright in civilian populations. Terrorism is about making ordinary people feel vulnerable, anxious, confused, uncertain and helpless. . . . The power of terrorism lies precisely in its pervasive ambiguity, in its invasion of our minds.⁷⁴

One of the most pervasive findings in the field of risk perception is optimism bias.⁷⁵ People often believe they are less at risk than other people when it comes to most threats. However, terrorism is an exception as shown in a disturbing study in Israel by Klar, Zakay, and Sharvit.⁷⁶ They found no evidence for optimism bias among Israelis.⁷⁷ Everyone felt vulnerable, unable to control or avoid the risk.⁷⁸ As a result, important activities of normal living were inhibited and quality of life suffered, without any benefits being perceived to result from such actions.⁷⁹

1. Risk Imagery

Imagery associated with a given risk shapes our perceptions of its probability. A central tenet of risk as feelings and its reliance upon the experiential system of thinking is that images, linked to affect, strongly influence behavior. One of the most dramatic images of the twentieth century was the mushroom cloud. This image, burned in the psyches of millions of Americans, has greatly hindered the development of nuclear power, "the peaceful atom," as Kirk Smith has observed:

Nuclear energy was conceived in secrecy, born in war, and first revealed to the world in horror. No matter how much proponents try to separate the peaceful from the weapons atom, the connection is firmly embedded in the minds of the public.⁸⁰

More than a half-century later, Slovic, Flynn, Mertz, Poumadère, and Mays found that people's dominant associations with the words "nuclear power" had to do with bombs, war, death, and destruction rather than with electric-

74. Philip G. Zimbardo, *The Political Psychology of Terrorist Alarms* 3 (2003) (unpublished manuscript, on file with the Missouri Law Review).

75. See Neil D. Weinstein, *Optimistic Biases About Personal Risks*, 246 SCIENCE 1232 (1989).

76. Yechiel Klar et al., *'If I Don't Get Blown Up . . .': Realism in Face of Terrorism in an Israeli Nationwide Sample*, 7 RISK DECISION & POL'Y 203 (2002).

77. *Id.*

78. *Id.*

79. *Id.*

80. Kirk Smith, *Perception of Risks Associated with Nuclear Power*, 4 ENERGY ENV'T MONITOR 61, 62 (1988).

ity.⁸¹ This helps explain the disparity between the perceived risks of nuclear power and x-rays.

Similarly, images from September 11, 2001, are emblazoned upon the memories of almost all who were alive on that date. The horror of such images augments the perception of risk of terrorism.

One key finding from risk perception research is that people seek to draw meaning from risk incidents. What does this mean for me? Is this an indication that this risk is greater than was thought? A powerful meaning underlying images from September 11th is one of *vulnerability*. It was startling to witness the degree to which a small group of determined individuals, in a very short time, so greatly disrupted the world's most powerful nation. We can expect such images to profoundly influence individual and societal behavior over the next century.

2. Probability Neglect

Although "risk as feelings" contains strong elements of rationality, reliance upon imagery and affect can also lead people astray. One of the most powerful cognitive distortions arising from risk as feelings, and associated with risks from terrorism in particular, is *probability neglect*. Legal scholar Cass Sunstein examines probability neglect and its implications in the context of terrorism.⁸²

[P]eople are prone to . . . *probability neglect*, especially when their emotions are intensely engaged. Probability neglect is highly likely in the aftermath of terrorism. People fall victim to probability neglect if and to the extent that the intensity of their reaction does not greatly vary even with large differences in the likelihood of harm. When probability neglect is at work, people's attention is focussed on the bad outcome itself, and they are inattentive to the fact that it is unlikely to occur.⁸³

Sunstein argues that probability neglect causes extreme overreaction to terrorist threats by both public officials and private citizens.⁸⁴ In noting the costly consequences of public fear and alarm, Sunstein argues that government should take action that reassures people, even if such actions are not justified

81. Paul Slovic et al., *Nuclear Power and the Public: A Comparative Study of Risk Perception in France and the United States*, in *CROSS-CULTURAL RISK PERCEPTION: A SURVEY OF EMPIRICAL STUDIES* 55 (Ortwin Renn & Bernd Rohrmann eds., 2000).

82. See Cass R. Sunstein, *Terrorism and Probability Neglect*, 26 *J. RISK & UNCERTAINTY* 121 (2003).

83. *Id.* at 122.

84. *Id.*

on technical grounds (i.e., even if they do not really reduce the threat but only appear to do so).⁸⁵

C. Toward Better Communication of Terrorism Risks

What can be done to communicate risk from terrorism in a balanced way, respectful of the threat yet not creating undue psychological stress? Because perceived lack of control is a key factor behind high risk perception and perceived vulnerability, it is important to educate the public about whatever careful and effective methods are being undertaken to control the risk.

However, communication by authorities will not be effective without trust.⁸⁶ Government must recognize the critical importance of actions that build and maintain trust, as well as its fragility—Trust can quickly be destroyed and is very difficult to regain.

It is also helpful to know that nature and technology mitigate some of the potential consequences of terrorist acts. For example, biological and chemical toxins are fragile and hard to disperse in the environment. Government should promote awareness of these natural and technological obstacles to terrorism so that Americans will realize that not every horror imaginable is likely to occur.

There are also some things individuals can do to avoid exposure and minimize risk. However, the government must communicate such preventative measures more clearly than the recent Homeland Security warnings which many people found laughable (seal your home with duct tape) and contradictory (stay in your home in the event of a radiological incident yet get as far away from the source as you can). Zimbardo has written a scathing critique of seven major warnings issued by the United States government, including the vague system of color coding associated with supposedly high levels of threat that never materialized, yet were not called off when the “threat” supposedly diminished.⁸⁷

When strong affect or fear threatens rational action, the authorities must appeal to reason. For example, those driving long distances out of fear of flying should be educated about the far greater risks associated with driving.⁸⁸ Those bringing a handgun into the home for “protection” should similarly be informed of the great risks that entails.⁸⁹

85. *Id.* at 131-33.

86. Paul Slovic, *Perceived Risk, Trust, and Democracy*, 13 RISK ANALYSIS 675 (1993).

87. Zimbardo, *supra* note 74.

88. See Gerd Gigerenzer, *Dread Risk, September 11, and Fatal Traffic Accidents*, 15 PSYCHOL. SCI. 286, 286-87 (2004); Michael Sivak & Michael J. Flanagan, *Flying and Driving After the September 11 Attacks*, 91 AM. SCIENTIST 6 (2003).

89. See Arthur L. Kellerman et al., *Gun Ownership as a Risk Factor for Homicide in the Home*, 329 NEW ENG. J. MED. 1084 (1993).

It seems obvious that designers of risk education and communication programs should work with experts in these fields, yet this does not seem to be happening. Such collaboration would help the government to work with the intended audience of each message. Designers need to listen to the public's concerns, collaborate in message development, and test messages and programs to see if they are working as intended.⁹⁰ Most importantly, all this should be done in advance of any crisis.

Our government directs immense resources at the physical and operational aspects of reducing the threat from terrorist attacks; however, significant support must also be given to education, communication, and mental health efforts, and research should be directed at understanding the pervasive impact of terrorism events and terrorism images on feelings of vulnerability, mental health, and the overall well-being of society. How are people's interactions with family, friends, and society altered by living in a world subject to terrorist actions? How are their minds affected?

V. CONCLUSION

In a symposium devoted to exploring the effects of fear and risk on law in times of crisis, my purpose in this paper is to point out the importance of the subtle and perhaps equally powerful impacts of a derivative of fear—*affect*. One of the extraordinary features of the human brain is the evolution of pathways and processes that carry the meaning and motivational force of fear and other emotions without the necessity of creating an emotional state. Emotional states are stressful and sometimes slow in onset and offset. *Affect* is fast and adaptive, shifting rapidly with attention and thought. Its importance in creating meaning and directing behavior cannot be overstated. As Damasio observes:

[s]ince what comes first constitutes a frame of reference for what comes after, feelings have a say on how the rest of the brain and cognition go about their business. Their influence is immense.⁹¹

Legal scholars have begun to outline the implications of the *affect heuristic* for law.⁹² As I write, a dramatic example of the power of imagery and

90. See Baruch Fischhoff, *Assessing and Communicating the Risks of Terrorism*, in SCIENCE AND TECHNOLOGY IN A VULNERABLE WORLD: SUPPLEMENT TO AAAS SCIENCE AND TECHNOLOGY POLICY YEARBOOK 2003, at 51 (Albert H. Teich et al. eds., 2002).

91. DAMASIO, *supra* note 12, at 160.

92. See, e.g., Jon D. Hanson & Douglas A. Kysar, *The Joint Failure of Economic Theory and Legal Regulation*, in SMOKING, *supra* note 70, at 229; Cass R. Sunstein, *Probability Neglect: Emotions, Worst Cases, and Law*, 112 YALE L.J. 61 (2002); Sunstein, *supra* note 82.

affect is playing out in the firestorm triggered by the release of photographs showing the abuse of prisoners in Iraq.

Ultimately, understanding the role of affect will inform age-old questions regarding the nature of human rationality. Contemplating the workings of the affect heuristic helps us appreciate Damasio's contention that rationality is not only a product of the analytical mind, but of the experiential mind as well. The perception and integration of affective feelings, within the experiential system, appears to be the kind of high-level maximization process postulated by economic theories since the days of Jeremy Bentham. These feelings form the neural and psychological substrate of utility. In this sense, the affect heuristic enables us to be rational actors in many important situations. But not in all situations. It works beautifully under some circumstances and fails miserably in others. The law must learn to tell the difference.