

Conceptualizing and Measuring Risk Perceptions 4/6/2003

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The volume of research on the determinants of health behavior is enormous, but that does not mean that the research is sophisticated about the constructs involved. In nearly all of this literature, the complex topic of how people think about risk is reduced to only two variables: a rating of probability and a rating of severity. A major reason for convening this workshop is to question whether these are the only features of hazards to which people attend and, if we agree that they are not, to ask what other features researchers ought to consider.

Table 1 contains a list of questions about risk perception that I would like to raise in this meeting. First, how do people think about probability? Having to take into account the likelihood of a particular event happening to us is such a central task of daily experience that we must have some way of analyzing, thinking about, or remembering this issue, but *how* do we do it. We are not born with numerical risk scales; I doubt very much that there is any type of numerical reference point in our brains. But what information or expectations do we store to summarize our beliefs or experiences with events? Are their “natural” categories of risk probabilities...ways that people naturally classify the likelihood of events? Perhaps people get by with a simple, 4-category system for probability: no chance, low, high, and certain. If we can discover the categories or cognitive structures that reflect how people think about probability, that will give us advantages both in predicting their actions and also in communicating risk probabilities. If we communicate with concepts and categories that are natural to people, it should help them understand risks better.

Table 1: Some Questions About Risk Perceptions

How do people think about probability?

- Assuming that they don't use numerical scales to store their perceptions in memory, what do they store?
- Are there natural probability categories (e.g., "high" vs. "low") that could improve predictions of behavior and that could facilitate communication about risk?

What other hazard attributes may be important?

- Does "severity" really capture such varied issues as delayed vs. imminent consequences, chronic vs. acute pain, disfigurement, catastrophic potential, and other objective features of hazards?
- What about subjective features of hazards such as their vividness, familiarity, availability, causal simplicity? Are they simply incorporated into severity or should they be treated separately?

Where do emotions—fear, anxiety, anger, depression—enter the into hazard-response equation?

- Do people separately regulate emotion and danger?
- What about worry, preoccupation, vigilance, and other hazard responses that are neither pure emotions no pure cognitions?

In addition to what people state about their beliefs, are there degrees of conviction that need to be recognized?

- Are judgments based on experience different from more hypothetical judgments?
- Is there are difference between judging oneself vulnerable and feeling vulnerable?

A second question is, "What are other hazards attribute are important?" The severity construct has always bothered me. It seems so unrealistic to assume that everything other than probability can be summarized by a single dimension. It is not difficult to think of specific features of hazards that appear to affect us: hazards that are far in the future generate different reactions than ones that are just around the corner; hazards may or may not cause pain or disability; some have catastrophic potential, potentially affecting many people, but others affect only one person at a time. Paul Slovic has done a great deal of research over the years examining

hazard attributes that influence judgments about the acceptability of technologies and the need for government regulation (Slovic, 2000), but parallel research on how people think about hazards for themselves--in particular, about their need to protect themselves--has never occurred. In planning whom to invite to this workshop, I asked Paul if anyone is studying whether individuals' personal decisions and behavior are influenced by hazard dimensions other than severity and likelihood. We were not able to identify someone who could speak to those issues. In fact, there is hardly any health behavior research that studies how various hazard attributes relate to severity judgments or whether these attributes affect judgments independent of severity judgments.

In addition to objective features of a hazard, such as its probability, its speed of arrival, and the nature of its harm, one can ask about "subjective" features of hazards, ones that can only be defined in terms of an interaction between the event and the individual. For example, a hazard may be experienced as more or less vivid than others. A hazard may be thought to have a simple causality, making it easy to think of ways—"scenarios"--in which they might happen. In contrast, for another hazard or person, the causal mechanisms and situations that could put us at risk are obscure. Infectious diseases seem to be a category of hazard in which causality—through direct, physical contact—is easy to visualize for most individuals, making people relatively risk averse. It is highly unlikely that all the hazards features listed in Table 1 are taken into account by a simple rating of severity. Looking for their separate effects would be a place to start.

There will be much discussion of emotion and affect in the rest of the workshop. It is very important to ask where these issues fit into the hazard response equation. It is not just fear that can be important; anxiety, anger, and depression also need to be considered. Do people

regulate and try to manage their emotions separately and differently from the way they manage and regulate danger? Howard Leventhal initiated and developed that idea in the domain of health behavior (1970), and Kim Witte has continued to study these issues (Witte, 1992), but affect is still absent in nearly all current health behavior theories. Other speakers are going to address these issues.

There is another class of constructs--worry, preoccupation, vigilance, intrusive thoughts—describing our reactions to hazards that may have strong effects on decisions and actions. Clinical psychologists refer to worry as a cognitive variable, but cognitive psychologists think of worry as an emotion. Neither group knows quite what to do with it.

When I mention worry and the other questions in Table 1, I'm not just brainstorming about possibilities. There is research—though not a great deal—demonstrating that these issues make a difference. How do we weave them together into a more complete notion of how people appraise hazards?

In addition to focusing on what people tell you about their beliefs on questionnaires or in interviews, we should also be asking about the differences between beliefs that are firmly established and ones that are tentative and easily changed. For example, judgments about hazards that are based on personal experiences are likely to be very different from judgments made about a risk that the respondent had never even considered until faced by a researcher's questions. In the study of risk perceptions, is there a difference between *judging oneself as being vulnerable* (possibly a spur-of-the-moment rating unlinked to past or future action) and *feeling vulnerable* (possibly a consequence of past victimization and personal experience). In hearing about studies of adolescents' risk perceptions, I often imagine them responding, "yeah, that *might* happen" without the risk seeming either real to them or worth serious attention. But what

does it mean to say that a risk “seems real”? This distinction is clearly related to Epstein’s distinction (1994) between the rational and the experiential systems.

The short-term goals of this workshop are (Table 2) to examine the meaning of perceived risk from a variety of research perspectives, and, by doing so, to arrive at a more sophisticated and more comprehensive conceptualization of perceived risk and at better ways to measure perceived risk. In the long run, I hope that careful study of perceived risk will improve the ability of theories to predict health behavior. An improved understanding of risk perceptions should help us to identify risk issues and dimensions that could make interventions more effective. Such an understanding could also help applied researchers find better ways to assess whether their interventions have succeeded in changing the way the hazards are perceived.

Table 2: Workshop Goals

Short-Term Goals

- Examine the meaning of perceived risk from a variety of research perspectives
- Arrive at a more sophisticated and comprehensive conceptualization of perceived risk and of ways to measure perceived risk

Long-Term Goals

- Improve the ability of theories to predict health behaviors
- Guide health promotion efforts toward more effective interventions
- Help applied researchers assess whether their programs have succeeded in altering the ways in which hazards are perceived.

Next, I would like to offer a personal anecdote. Some years back, I returned home with my family after dinner at a neighbor’s house at around 9 o’clock in the evening. All the lights were on in our house, and we knew immediately that something was wrong. We had not left the lights on. When we entered the house, we realized that a burglar had just left. Jewelry, a camera, and a few other items had been stolen. It was upsetting, but it was not a traumatic experience.

The house was not torn apart; the camera was found in the back yard; and the jewelry was replaceable. But from then on, we always took extra care to lock the door and to leave lights on whenever we went out.

I've asked myself many times what it was in that experience that changed my behavior. It seems a wholly insufficient explanation to say that my beliefs about the probability or severity of victimization had changed. If I had to make an estimate of the likelihood of burglary, I suppose that my estimate might have gone up slightly, but I don't think that's it. What stood out in my response was the enormous change in the *availability* of thoughts about burglary. For years after, every time we drove home in the evening, I found myself watching to see if the lights were those that we had left on. Maybe the frequency of thoughts about a risk—whether produced from internal or external sources—are as important as the content of those thoughts in motivating action. Here are some data that touch on this issue.

The data in Table 3 come from a study of three communities after they had been struck by very serious tornadoes (Weinstein, Lyon, Rothman, & Cuite, 2000). Our aim was to predict which community residents would take recommended actions to make themselves better prepared for the next tornado. Who would put aside water and a transistor radio, designate an area in their home as the safest place to go, or create a plan with the family for what they would do when the next warning occurred? In interviews immediately after the damaging tornado, we assessed residents' views about the absolute likelihood of future tornadoes and about relative likelihood (comparing their town and their home to other towns and other homes in the same state). We assessed how anxious they were when thinking about tornados. And we posed questions about vigilance (how easily tornadoes come to mind in various situations, such as

when you see a dark cloud overhead), frequency of thoughts, and intrusive thoughts. We gathered these latter questions together into a composite variable we called preoccupation.

If we look at the column in Table 3 referring to initial actions, we see that high anxiety actually impeded protective action, but preoccupation was strongly and positively associated with taking more precautions. But these are only cross sectional data, based on interviews conducted two weeks after the tornados. Fifteen months later, we interviewed people again to learn about the actions that they had taken in the subsequent time period. The data in the right

Table 3: Post-Tornado Preparatory Action

Odds Ratios in Logistic Regression of Action

| | Initial action | Action at one year controlling for initial action |
|---|----------------|---|
| <i>Absolute likelihood</i> of future tornadoes ($\Delta=.82-.83$) | 1.07 | 1.11 |
| <i>Relative likelihood</i> of future tornadoes ($\Delta=.61-.78$) | .99 | .93 |
| <i>Anxiety</i> when thinking about tornadoes ($\Delta=.90-.92$) | .69*** | .88 |
| <i>Preoccupation</i> (vigilance and intrusive thoughts about tornadoes) ($\Delta=.83-.89$) | 2.09**** | 1.49*** |

Column of Table 3 refer to actions at one year, controlling for initial action. Likelihood judgments, whether absolute or relative, did not predict who would take more action, whereas

preoccupation remained a strong predictor. Thus, frequency and availability of thoughts about hazards seems to have predictive power beyond that of judgments about risk likelihood.

In a different study currently underway, we have been looking to see who would get vaccinated for Lyme disease. We first interviewed people before the Lyme vaccine was available; it had been approved by the FDA only a month or two earlier. The interviews covered a range of topics, including intentions to get vaccinated. Among other factors, we looked at perceptions of absolute likelihood, worry about getting Lyme disease, and frequency of thoughts about Lyme disease. We then came back a year later and reinterviewed 745 people to find out who had actually received the vaccine. This study has a nice simple behavioral outcome: you get a shot of the vaccine or you don't. The left hand column of Table 4 shows the cross sectional predictors of vaccination intentions. You can see that worry was the best predictor of intentions. When we look at actual vaccination 15 months later, worry was still the best predictor although perceived likelihood of getting Lyme disease if not vaccinated, and frequency of thoughts about Lyme disease were also good predictors of action.

| Table 4: Lyme Disease Vaccination Predictions (N = 745) | | |
|---|--|--|
| | Intentions to get vaccine (Pearson's r) | Vaccination 15 months later (odds ratio) |
| <i>Absolute likelihood</i> (6-point numerical scale; 0%--100%) | .27**** | 1.60**** |
| <i>Worry about getting Lyme disease in the future</i> (4-pt scale; not at all – a lot) | .36**** | 1.78**** |
| <i>Frequency of thoughts about Lyme disease</i> (3 questions; $\alpha=.69$) | .30**** | 1.36**** |

However, there are many ways to assess perceived likelihood, and, as I suggested earlier, perhaps there are natural categories of likelihood. If we can identify such categories we should get better predictions. Consequently, this study had actually included several different likelihood scales. We had a 6-point percentage scale, a 5-point verbal scale, and a simple, little 2-point scale, “Is it unlikely or likely that you will get Lyme disease if you don’t get vaccinated?” All of these scales significantly predicted who would get vaccinated. However, the 2-point scale was clearly the best predictor. In fact, once we put the 2-point verbal scale into the prediction equation, none of the other scales, including the worry scale, added anything new. Those people who said that they were likely to get Lyme disease if not vaccinated were about five times more likely to get the vaccine than those who thought they were unlikely to get the disease. That is a very large difference.

| Table 5: Risk Question Wording and Lyme Disease Vaccination Predictions | |
|--|--|
| | Vaccination 15 months later (odds ratio ¹) |
| <i>Likelihood of getting Lyme disease if not vaccinated</i> | |
| <i>6-point percentage scale</i> 0-1%, 10%, 25%, 50%, 75%,100% | 1.60**** |
| <i>5-point verbal scale</i> definitely will not, probably will not, equal chance, probably will, definitely will | 1.72**** |
| <i>2-point verbal scale</i> unlikely, likely | 2.49**** |
| <i>Worry about getting Lyme disease</i> 4-pt scale; not at all – a lot | 1.76**** |

Whether scales are treated as linear variables (1 df) or categorical variables (3-5 df), none improves the prediction of the 2-point scale.

¹Based on normalized prediction variables.

The data I have just presented concern a construct, “preoccupation,” that is not a standard measure of perceived risk and not a variable in any of the most widely-used theories of health behavior and another construct, “worry,” that is also not a standard measure or theory ingredient. The data also demonstrate how conclusions can differ as a function of different likelihood measures.

I have tried to point out issues that take us far beyond the way risk perception is normally considered in health behavior research. My data suggest that these issues make a difference, that the standard interpretation of risk perceptions as reducible to ratings of likelihood and severity fails to address essential questions about the meaning of perceived risk and provides a misleading impression about the strength of links between perceptions and action. The remaining speakers in this workshop will raise additional questions about the conceptualization and assessment of risk perceptions.

References

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