

Conceptualizing and Measuring Risk Perceptions Workshop

February 13-14, 2003

Embassy Suites at the Chevy Chase Pavilion, Washington, DC

Summary of Discussion Sessions

Conceptualizing and Measuring Risk Perceptions: Looking More Deeply Into the Influences of Risk Perceptions on Health Decisions and Behaviors

Neil Weinstein, Ph.D.

Professor, Department of Human Ecology, Rutgers University

Discussion

Dr. Greenwald noted that there likely are individual differences among subjects in terms of objective likelihood because they were outdoors more or were in settings where they might get bitten by a tick. However, it also may be that there is a subjective factor that is totally independent of any objective likelihood. Dr. Weinstein replied that study subjects live in high-risk counties and are homeowners rather than apartment dwellers. Nevertheless, there are individuals who garden/do not garden, take walks/do not take walks, etc., so there are differences in objective risk. Dr. Weinstein and colleagues have a series of questions on these issues, but have not yet tried to relate them to vaccination behavior.

Dr. Millstein reported that she often refers to the “50-50 blip” when subjects give an excess of responses. The 2-point verbal scale appears to be a natural way that people think about risk because they tend not to think on a population basis. Individuals generally think to themselves “the risk is going to happen,” or “the risk is not going to happen,” partly leading to the “50-50 blip,” and this phenomenon may be closer to the type of natural measure seen in the study by Dr. Weinstein and colleagues. Dr. Weinstein indicated that more data are needed, and that in these types of studies, what subjects tell researchers about what they think is not necessarily all that they can think, and there may be some difficulty related to subjects expressing their thoughts.

Dr. Slovic asked about the perception of benefit from an activity, noting that there is evidence that risk and benefit sometimes are confounded in people’s minds. Dr. Weinstein explained that this is an empirical question dealing with how people conceptualize risk and what they combine and keep separate. His goal for this area of research is to more accurately understand how people think about hazards so that interventions can be identified or developed to help them avoid suffering from a hazard. If the benefits cannot be split from the risks in terms of people’s conceptualization, then they should not be removed from consideration.

There are risk perception differences between the kind of behaviors people enjoy doing (e.g., smoking) and issues where there are avoidance motivations (e.g., getting Lyme disease), Dr. Cameron explained. When examining risk, researchers should consider whether they are assessing the risk of an illness or hazard versus the riskiness of a type of behavior in which

individuals might want to participate. It appears that these situations have different variables, such as benefits, that are operational.

Dr. Rimer asked whether providing study subjects with statistics distracts them in some fundamental way from thinking about what those numbers mean. A recent review on informed decisionmaking found that people were less influenced when they were given specific risk numbers, such as the Gail model score for breast cancer. Individuals may react more on a “gut” level when they are in “likely/unlikely” scenarios and are not presented with statistical information. Subjects may become distracted by numbers, and as a result may consider factors not related to their behavior. This area requires a greater level of understanding. Dr. Weinstein added that there also may be a significant difference between how people think and how the research community can communicate to them. There may be instances where researchers are not able to communicate a depth of information in a useful way.

From a psychometric standpoint, one consideration is that when giving study subjects a 7-point scale, it may only function as a 2-point scale based on subjects’ cognitive abilities (e.g., perhaps the anchors are not clear, perhaps subjects clearly think the issue is a yes/no issue), Dr. Masse explained. When study populations do not function at the level of measurement scales, it adds measurement error into analyses.

Dr. Cappella asked whether researchers constrain themselves if they start to think about risk only as a single measure (e.g., as a scale, regardless of its complexity or simplicity, that is going to predict an outcome), versus considering risk in a more complex way that involves aspects of risk behind a judgment that are activated from time to time and from circumstance to circumstance. Risk may be a fairly temporary and transient type of measure at a point in time that gets activated based on components of the cognitive map associated with risk that a person has at a given juncture in terms of consequences and other factors. Should researchers tie themselves to a notion of a single scale that would be most efficient and allow them to predict subsequent behavior easily and readily, but at the same time possibly create a significant mismatch between the way people think about risk and how they actually process risk at a given point in time? Dr. Weinstein noted that the population in the study on Lyme disease vaccination was well aware of the risk because they live in an area where it is always present. He cautioned that researchers must be careful about conflating probability judgments with all of the other dimensions associated with risk.

Dr. Croyle commented that an interesting empirical study would be to examine the parallel between these data, where subjects appear to dichotomize into likely/unlikely scenarios. One hypothesis is that people’s lumping of their risk construct maps onto how much they can lump the phenomenon that they are trying to perceive. Subjects might use the most parsimonious mental risk model that matches the phenomenon. In this case, people are lumping into a dichotomous mental construct because the phenomenon is dichotomous (i.e., Lyme disease/no Lyme disease; vaccinated, not vaccinated). However, if the study was asking about the progression over time for a chronic disease like diabetes, there is not a dichotomous frame with the phenomenon or the problem (it is not a yes/no, have it/do not have it type of scenario), and therefore subjects will be less likely to dichotomize. They will use the most parsimonious mental model of risk that still allows them to map onto the phenomena. Dr. Croyle added that as

the phenomena in question becomes more complex, individuals are less likely to say that the scenario will or will not happen. Rather, they will construct something more complex, but it always is going to be the most minimally complex mental model that will work in that situation.

Applied Science: Population-Level Health Promotion Programs

Brian Flynn, Sc.D.

Associate Director, Office of Health Promotion Research, University of Vermont

Discussion

Dr. Weinstein asked if the people who are left performing the risky behavior when Dr. Flynn and colleagues enter the field are tolerant of the risk or have very strong denial mechanisms. Individuals who are responsive to the risk already have changed their behavior, leaving those on the resistive end of the distribution. An incorrect conclusion—that the risk is never important—could be formed in this instance (however, the risk might be very important at a different time). Dr. Flynn agreed, noting that by the time he and his associates get into the field, those individuals who are continuing to smoke cigarettes have survived a great deal of risk information; they have been bombarded through multiple media outlets with information about the risks of smoking. Those individuals who are ready to change once they are able to get adequate information and process it rationally (and who have the discipline to make the change) already have done so.

Dr. Vishwanath asked whether Dr. Flynn and colleagues had looked at the proportion of people who agree that smoking is a problem, or whether they examined media coverage, noting that they are not the same. Dr. Flynn responded that they had examined media coverage, and that it clearly is linked to the proportion of people who agree that smoking is a problem, resulting in an overabundance of health information via the media. One example is that the rise in the prevalence of smoking stopped shortly after the release of the *Surgeon General's Report on Smoking* in 1964, due to people absorbing the information and making behavior changes—a combination of the media and then the level of acceptance within the community.

Dr. Slovic noted that an obvious hypothesis is that smoking is related to nicotine addiction, and that these individuals are having more trouble getting out of the addictive state. This could be because something physiological is going on inside them, or it may be psychological. He asked whether Dr. Flynn and colleagues examine this aspect of smoking in their community intervention, and whether they try to individualize or target different treatment approaches to different people in this way. Dr. Flynn responded that he was not sure how to conduct this sort of intervention, and that it is a struggle from a public health perspective. Dr. Flynn sits on the Board of a statewide program in Vermont that provides free nicotine replacement prescriptions to low-income people on Medicaid. Currently, the program is in negotiations with insurance companies and is conducting a pilot study on coverage for nicotine replacement therapy.

Dr. Cameron described a study she and her colleagues are conducting in which they are trying to help women quit smoking. In one of the conditions, women are provided with a health education group. In Dr. Cameron's experience, the usual risk information does not have a significant

impact on them because they are well aware of the risks. These women ask for powerful graphic risk information that will give them a high level of motivation. Specifically, they want to see a diseased lung that is blackened with cancer. Perhaps smokers can still respond to risk information, but it may have to be of a different sort, possibly using graphic and scary images. Dr. Flynn noted that there is a similar study underway that has graphic images of diseased lungs on packages of cigarettes in Canada but not in the United States. The study is comparing similar populations in the two countries.

Dr. Abrams explained that researchers should look at individual differences in a number of categories, and perhaps even use these as natural experiments to see how different risk schema map to these key individual differences. They also should examine nested contextual factors interacting with those individual differences, which will lay out a whole matrix of changes in key parameters that could bring out some important components of how risk perceptions differ. In other words, looking at those parameters as covariates results in completely different ways of exploring these interactions, and this type of analysis has not been conducted very often. Researchers tend to focus on individuals over time or on the macroenvironment and populations; they do not bring the two together as often as they should.

Dr. Slovic noted that Dr. Cameron's comment about the blackened lung relates to Dr. Weinstein focusing the group on the issue of severity. It is one thing to be informed about a consequence and to know a consequence as a name or a concept, and another to experience the consequence in a more real way. Looking at a blackened lung is one way to get beyond the name of a consequence. Another approach would be to meet with or get to know someone who is dying from lung cancer and learn about their experience with the disease. The difference between knowing the consequence in an abstract sense and knowing the experience of the consequence is lacking in many cases. Dr. Flynn briefly described a series of television messages in Massachusetts that focused on an individual who died of lung disease. Although it was not a controlled study, the messages appeared to have an impact.

Dr. Rimer described a number of studies that have tried to focus on testimonials and stories of tragic cases of people dying of lung cancer. Part of the effect is to make the risk more vivid, and more work is needed on making the risk more real to individuals. There also are some interesting cultural differences. Making risk more real to people is important, and the level of information diffusion for these types of issues is important, because familiarity with the risk may cause people to be turned off from more messages. It may be that early on, the risk information is important and persuasive, but affect, emotion, and other factors may become more important and may get in the way of hearing the risk message or personalizing the risk message.

Dr. Cappella asked how one activates, in a vivid way, the risk that might be associated with changing behavior. When does the activation of risk to such a degree raise negative consequences and assessments of risk versus producing the kind of anxiety and fear response that leads to withdrawal? In creating and using vivid messages, emotions are activated that can produce withdrawal (a boomerang effect). When do the cognitive consequences and the emotional consequences agree, and when do they start to depart from one another? Dr. Croyle explained that previous studies of two dimensions of perceived risk or perceived threat and perceived control have found that as long as the perception of control accompanies the greater

threat, a behavior change will result. A key element is to what degree researchers separate out these component dimensions such as probability and severity.

Dr. Flynn asked participants to keep “the bigger picture” in mind. His case study did not address risk perceptions, but it did include other factors smokers consider, such as access to resources, direct support, modeling, and community support for their efforts to quit. Once an individual is on the road to trying to quit, they are going to need these, so they should not be left out of the picture when smokers’ risk perceptions are analyzed.

Risk and Discrete Emotions: Anticipated Emotion as Risk and Benefit

Joseph N. Cappella, Ph.D.

Professor and Gerald R. Miller Chair, Annenberg School for Communication, University of Pennsylvania

Discussion

Dr. Greenwald asked whether an analysis was conducted in which emotion (e.g., “proud”) was taken as the dependent measure and predicted in the same hierarchical regression, using intention as a predictor of emotion. In other words, is asking a person if they are proud of their intention another approach to asking them what is their intention? Dr. Cappella responded that such an analysis has not been carried out. The study does include following up with subjects (97% of subjects agreed to participate in a followup telephone interview) starting in April or May of this year. It is hoped that the evidence using emotion specifically, as well as the other predictors, accounts for some of the quit attempts, the length of quit attempts, and some successful quit attempts.

Dr. Rimer asked whether there is a role for risk in informed decisionmaking, as opposed to only behavior and intention, in terms of early detection behaviors. Dr. Cappella noted that the answer to this question is unclear; however, a decision to undergo a test can be considered a behavior that an individual intends to carry out. He noted that the social cognition and communication literature is similar to the decisionmaking literature in many regards, particularly with how individuals work with information in a psychological sense. As a result, the decisionmaking literature can be tied into behavioral intention types of theories. It is difficult to distinguish between an individual’s intention to undergo a test for the early detection of breast cancer and an individual’s cognitive decision to have that test. If risk is valuable in the decisionmaking context, and if it can be shown that a single, simple, summary measure of risk will work in this context, then it will work in the behavioral intention context.

Dr. Millstein noted with interest that the most predictive items in the study were “hopeful” and “proud.” She asked whether there were any data on the degree to which individuals who could anticipate emotions such as “proud” and “hopeful” may serve as a proxy for or reflect some degree of self efficacy. Dr. Cappella explained that a widely accepted, effective measure of self efficacy specific to smoking was included in the study as a control variable. Dr. Millstein also asked whether it was possible to measure the degree to which subjects were or were not able to anticipate/imagine what might happen, how they might feel, and whether there was a measurable

difference between those who were not able to imagine what might happen and those who were able to do so. Dr. Cappella indicated that he was not sure if this difference could be measured. It is hoped to examine family smoking history as an interaction variable to determine whether there are different effects with subjects who have a stronger family smoking history. The study did not examine family smoking history to determine whether the subgroups may have had a genetic predisposition or whether individuals felt they had no chance of quitting because they have identified themselves as habitual smokers.

Dr. Croyle asked whether Dr. Cappella had considered tying this study to the body of literature in social cognition, demonstrating that when individuals are persuaded to imagine an event, they see it as more probable (e.g., examining the link between how easily an event is imagined and the event's perceived probability). If individuals are more able to imagine themselves as nonsmokers or as quitting, it would correlate with intention, and intention is, in a sense, a probability (e.g., "I can imagine myself quitting," "I am intending to quit," "I can visualize myself quitting"). This ties into the perceived probability of quitting and the link between the ability to imagine an event and the probability of the event, as does emotion (e.g., the degree to which an individual can imagine him or herself feeling "proud" or "hopeful"). Dr. Croyle added that these concepts also are found in the rumination literature in terms of how people ruminate about events that they dread and can imagine occurring. Dr. Cappella replied that he had not yet tied his study to these bodies of literature. He noted that the study does include two different measures of intention (i.e., "will quit," and "try to quit"). The predictability for "will quit" is, not surprisingly, lower, but substantial increments to behavioral intention are observed with "will quit."

Dr. Weinstein noted that if risk is viewed as being equivalent to consequences, then there may be no difference between health behavior and any other type of behavior or decision, whether it is buying a car or choosing a career. Health behaviors may be part of the same domain of intended behavior. One problem with this scenario is that there may be features of risks or hazards that can be studied by focusing on the properties of hazards (e.g., time, imminence, catastrophic potential). There are processes that are somewhat unique to health behaviors (e.g., risk resistance to personal vulnerability is not as much of an issue in other areas as it is in health behaviors), and if health behaviors and vulnerability are considered as just another behavior, these processes and features may be overlooked. Dr. Cappella asked whether this could be avoided if questions regarding consequences are asked in terms of a negative consequence or need, and if subjects' personal vulnerability is made more prominent, could more emotional behavior be measured. Dr. Weinstein responded that although this may represent a measure of emotional behavior, it does not address the fact that in this domain, there often is a significant gap between what subjects hear about risk and what they believe. This area requires further study. Dr. Cappella clarified that the measures used in his study are not intended to address this gap; rather, they are addressing individuals' beliefs. He acknowledged that there is a gap, and that part of the intervention development and implementation process is creating interventions to close this gap. If researchers are going to focus on consequences in both an objective and subjective sense, and if vulnerability is where the research community believes there are levers for moving cognition (and hopefully intention, and ultimately, behavior), then there should be a focus on personal consequences to close the gap between personal consequences and actual causality.

Dr. Weinstein noted that the study includes measures of probability in its attitude measures. This is one approach to conceptualizing perceived likelihood, one that is different from approaches discussed earlier in the workshop. This approach measures subjects' being sure of an event occurring as opposed to measuring the magnitude of the event occurring. Dr. Cappella remarked that this approach asks subjects about their perceptions of consequences to themselves that are relatively immediate. Even if these consequences are "made up" in the sense that individuals are simply guessing or using lay theory or public knowledge of the consequences of a particular action, and if these perceived consequences are grossly in error, then it suggests an area at which an intervention needs to take place to communicate factually correct and accurate information. As an example, Dr. Cappella explained that a great deal of the work in the antidrug area focusing on beliefs has found that many of the antimarijuana messages boomerang with young people. One class of antimarijuana messages that does not boomerang are messages that focus on what using marijuana regularly does to adolescents' parents and how their parents feel about it. Not surprisingly, low-risk adolescents report believing that their parents will be very upset. However, high-risk adolescents also report believing that their parents will be upset. A number of advertisements using the impact of marijuana smoking on adolescents' parents have been rated as highly effective, even by high-risk teens.

Dr. Greenwald asked about the validity of the "try to quit" or "will quit" intention measures on actually quitting smoking. Smoking might be an area in which behavioral intention measures are not very predictive. Dr. Cappella noted that there are few prospective studies in this area that examine subsequent behavioral activity. There are, however, some differences depending on the populations being examined. Not surprisingly, the behavioral intention measures are more effective in predicting smoking when the population includes both smokers and nonsmokers. With regard to quitting, the behavioral intention measure generally is not as effective of a predictor. It is slightly more effective in populations of both smokers and nonsmokers (e.g., predicting the likelihood of taking up smoking and the likelihood of quitting smoking). Among populations of smokers only, the predictions are not as accurate, which is part of the reason the current study is being conducted. Overall, findings in the literature on behavioral intentions predicting smoking cessation are inconsistent.

Dr. Weber noted that in conducting the study's followup, it may be useful to assess emotions at the time of decisionmaking to try to make the distinction between concepts such as "anticipated" and "anticipatory." There clearly is an overlap between the two as individuals anticipate how they are going to feel in 1 year, for example. Dr. Weber explained that this anticipation also elicits a certain amount of affect at the moment of the decision, and in a way, the effect of the emotion at the time of the decision drives the behavior and could be considered as a second pathway. Dr. Cappella added that such a secondary pathway may produce emotional responses that counter rational responses, and that there may in fact be two pathways pushing in opposite directions in some cases. Part of the reason the emotional component was added to the study on quitting was to try to improve the predictability of this measure. He noted that clarifying and characterizing the relationship between intention and behavior is a difficult undertaking.

Use of the Implicit Association Test in Risk Assessment

Anthony G. Greenwald, Ph.D.

Professor, Department of Psychology, University of Washington

Discussion

Dr. Slovic explained that Dr. Greenwald's results fit with data he and his colleagues collected when they asked smokers if they would start smoking again. They received tremendously negative responses, and the negativity increased the longer the person had been smoking. It would be interesting to use this information with samples of smokers to see if the effect size Dr. Greenwald and colleagues found increased with the amount of current smoking, length of smoking, sense of being addicted, etc. Dr. Slovic asked how Dr. Greenwald and colleagues would compare their results with what one might get with a Fazio-type measure that would be a straight reaction time between association of smoking with other qualities. Dr. Greenwald noted that this question has, in other research contexts, been a cause for concern. The sequential priming measure is believed or interpreted to measure associations involving the specific stimuli that are presented. If climbing, hiking, and running are used to represent the concept of exercise, Fazio would indicate that a priming measure examines the association of positive valences with the individual terms climbing, hiking, and running. It is clear that with the Implicit Association Test (IAT), it is more the category at which the researcher is examining the associations. Another difference, which is important psychometrically, is that priming measures are notoriously low in internal consistency and test/retest reliability, which is true of almost all latency-based measures. Dr. Greenwald further explained that the IAT, although also a latency-based measure, has quite high internal consistency, usually in the .80s, and the test/retest reliability is on the order of 0.6 and sometimes higher. For practical purposes, this turns out to be an important difference from the priming measure.

Dr. Abrams asked about the evolution or the progression of these associations over time, specifically whether Dr. Greenwald and colleagues studied, for example, groups such as children who are not yet smoking but clearly have some cognitions about smoking because of advertising. It would be interesting when they take their first puff to see what happens to that cognitive schema of expectations against the stark reality of the first experience, and then how that influences sequential experiences. Dr. Greenwald replied that although these data could be interesting and useful, this particular IAT smoking study did not address this type of longitudinal question. Dr. Abrams added that little is understood about the early decisions children make. For example, approximately 70 percent of children try a cigarette, but only about 36 percent progress to regular smoking, and they stop smoking at various stages. It would be interesting to examine the emergence of what differentiates those children, all things being equal in the first three cigarettes, who decide this is not how they want to see themselves versus a child or teen who feels that smoking might fit with their emerging self image and then becomes addicted.

Dr. Greenwald noted that it would be interesting and useful to administer an IAT before and after the first cigarette. He and his colleagues considered trying to represent the aspects of self, such as ideal self or actual self, in the IAT, but the test requires that subjects are knowledgeable about the concepts being used, and it is difficult to portray concepts such as ideal self and actual self on the IAT. Furthermore, his research group believes that the concept of actual self does not exist

for this population. Subjects have an easier time associating self with the ideal characteristics than with actual characteristics when asked to associate self with trait adjectives representing ideal characteristics versus actual characteristics.

Dr. Windschitl asked whether the finding that smokers associate smoking with negative valence more than positive valence would depend on what particular valence words were used. Dr. Greenwald replied that it does not depend on which particular words are used, but only on whether the words used are positive or negative. The characteristics of the words used are easily classified by the subjects, so the valence is fairly consensual and unambiguous. Dr. Windschitl noted that Dr. Greenwald and colleagues' study used positive valence words that anyone would recognize as positive, but if the words were switched to words such as "relief" and "relaxation," while more narrowly focusing on some of the consequences of smoking a cigarette, smokers might show a positive response. Dr. Greenwald agreed, explaining that these words were selected to represent "relaxation" and "enjoy" for the purpose of using concepts that are smoking related and more narrowly defined than the general concepts of positive and negative valence. When using the more narrowly defined items, the category labels should also be changed to indicate the more specific categories.

Dr. Greenwald added that the IAT can be used to study anything in the health domain that can be represented in terms of concepts that already exist in people's minds. Most IATs take only minutes to create, according to Dr. Greenwald, who has streamlined the IAT creation process. When asked about creating an IAT to study how hard people think it is to quit smoking, Dr. Greenwald replied that this type of study might be beyond the scope of the IAT because it is propositional knowledge that is difficult to reduce to representation as a single association between two concepts (it involves self, smoking, and quitting, so there are at least three components). An IAT might be used to examine the association of quitting smoking with emotions, however. Dr. Weinstein asked about using an IAT to study the association between "quitting is easy" and "quitting is hard." Dr. Greenwald responded that he would be worried about confounds because "quit" is negative, "easy" is positive, and "hard" is negative, so it may result in an association between "quitting" and "hard" that was due to their shared valence. This type of unintended confounding presents a significant problem in designing IATs.

Dr. Cappella asked, in terms of social smokers, how Dr. Greenwald would include stimulus words in an IAT that are not simply shared in terms of their overall meaning, but actually represent the strongest negative and strongest positive so that there is a balance of what is perceived to be the most negative and the most positive, rather than just positive ones and negative ones that happen to be shared. According to Dr. Greenwald, this question confronts some of the challenges in designing IATs. There are some IATs that can be designed in just a few minutes, but when there are worries about possible confounds between the categories, it can be challenging.

Dr. Cameron noted that there is the potential for IATs to be used in many interesting ways in terms of examining health behaviors and risk. One of the most useful ways may be dealing with concepts for which there are a high level of desirability. In her research on exercise, she has found that there is a good deal of social desirability concerning self efficacy; everyone likes to think they can exercise, and she and her colleagues have been trying to find ways to examine the

implicit associations between “can I” and “exercise” to try to avoid the self-report biases that are seen when individuals are asked whether they can exercise, and they say “of course.” She asked whether this type of concept could be used with an IAT. Dr. Greenwald responded that an IAT could be developed that involves self and exercise, and then contrasts exercise with some other positive, such as representing the idea of relaxing, sleeping, or napping—positives that are the antithesis of exercise—which could result in a determination of whether the person associates self more with the concept of exercise than with some antithetical, but positive, concept. Including the concept of self efficacy in an IAT as a propositional representation rather than an association is a difficult, but not impossible, undertaking.

Dr. Croyle noted that there are many behavior change domains in the health context, where researchers have been frustrated at not being able to obtain effective mediational measures in terms of affects. In many cases, the proposed mediator is an experiential process at that associative mechanism, as opposed to a rational one. It would be interesting to pit IAT against some of the classical behavior change mediators, in response to health communication interventions, for example, to determine which pathway is better and distinguish the associative and experiential pathways. Dr. Greenwald added that research has been conducted, mostly in Germany, in which subjects were asked to try to fake answers on the IAT. This resulted in a minimal effect on the overall IAT results. He also noted that the IAT usually is conducted via computer on a desktop machine, but it also works on hand-held devices, and can be Web-based.

Dr. Cappella asked about how to address the error rates when individuals are faced with the combined categories on an IAT with a possible social desirability response (e.g., they do not want the test to reveal that they operate out of a gender stereotype). This is a common problem for all reaction-type studies. Dr. Greenwald noted that results of a study using Web-based IAT data indicate that even when errors are left in the data set, the IAT can tolerate fairly high error rates.

Dr. Windschitl explained that one of the self report measures that has a strong social desirability component to it for smoking-related questions is how “cool” individuals think they look when smoking. Many people may think that they look “cool” when they smoke, but they would not want to report that in a self report measure. He asked if an IAT could be created that involved “cool” images of smoking and “ugly” images of smoking, and correlate that or pair that up with “self” and “other.” Dr. Greenwald replied that this would be a relatively easy IAT to construct.

Measuring and Conceptualizing Perceptions of Vulnerability/Likelihood

Paul D. Windschitl, Ph.D.

Assistant Professor, Department of Psychology, University of Iowa

Discussion

Dr. Croyle asked Dr. Windschitl to discuss individual differences in more detail, asking whether there are differences in people’s preferences for the intuitive versus the objective way of thinking about risk and probability. In survey methodology literature, use of the cognitive interview method of developing survey items often results in survey developers dropping the objective form because the majority of people interviewed and asked to think out loud about how they are

interpreting a question item will give an intuitive response. This leads survey developers to change the item to the intuitive form. In terms of individual differences, he asked whether Dr. Windschitl and colleagues considered connecting this work to numeracy and scientific literacy, because the study population may have a significant effect on the pattern of data. Dr. Windschitl's point about the frequency of thought measure appears to be very similar to measuring worry, so there is a concern that study subjects may not differentiate between "think about" and "worry about."

Dr. Windschitl agreed that the worry questions may tap into the frequency of thought notion, and that many of these ideas are more appropriate for certain populations than others. With regard to asking about frequency questions, Dr. Windschitl and colleagues were attempting to determine how often subjects actually make a decision when they engage in a behavior, considering in a very consequentialistic fashion the pros and cons, the risks, and the likelihood before making a decision, versus occasions when they engage in the behavior without making a decision for that particular behavior. Dr. Croyle also noted that in terms of the validity of self reports about the frequency of thoughts, the ecological momentary assessment literature indicates that when data are collected on a daily basis, there tends to be a low correlation between daily reporting versus weekly or retrospective self reporting and frequency of symptoms, behaviors, thoughts, etc. Dr. Windschitl admitted that this could be a limitation, and it could be the case that one type of subjective report of how much subjects think they have been worrying about something actually provides more information about how salient that worry is for them, more so than their objectively reporting how often they worry about it. Two people can report worrying about the same thing for 5 days, and this may mean a great deal of worry for one of the individuals while not being nearly as significant for the other individual. Dr. Cappella noted that one way to avoid the problems associated with constant daily reminders or daily inventories is to use a random sample approach whereby subjects carry pagers and are paged during the study at various times.

Dr. Slovic explained that in terms of distinguishing between objective probability and a subject's feelings, one experiment would be to put subjects under time pressure, which would make it more likely that they would rely on the vulnerability feeling-based system because they do not have time to be more analytical. He also noted that worry might confound with severity and with sense of control. For example, individuals tend to worry more about things that they think they can do something about (e.g., some people may not worry as much about a terrorist attack because they feel they cannot do anything about it).

Dr. Windschitl proposed that worry is on one end of a spectrum, beliefs about the objective probability of an event happening are on the other end of the spectrum, and more intuitive perceptions of the likelihood of the event happening are in the middle. Each of these three factors is distinct, and should be treated separately. Dr. Windschitl and colleagues focus a large part of their research on demonstrations in which subjects intuitively feel one way, but when asked for a numerical response, they respond quite differently from their intuitive feelings. He explained that he views beliefs about objective probability and intuitive perceptions as cognitive, almost consequentialistic, notions that are separate from the more affective emotional components.

Dr. Weinstein asked if intuitive feelings are better predictors of behavior than beliefs. Dr. Windschitl replied that this is the case in the majority of instances, but there likely are some cases in which objective beliefs determine whether a person engages in a behavior. However, for most of the behaviors studied by experts, intuitive perceptions drive behavior. Dr. Weinstein then asked if, when subjects are asked for a probability or frequency estimation on a rating scale, this still taps into a concern orientation, or would this be an approach to getting at the more objective belief components. Dr. Windschitl replied that a number of researchers have pointed out differences between numeric probabilities and numeric frequencies. For purposes of this workshop, numeric frequencies and numeric probabilities are likely to show a good deal of overlap.

Dr. Greenwald noted that the pairs of measures suggested by Dr. Windschitl capitalize on the implicit conversational pragmatics in which researchers are implicitly requesting subjects to tell them something that is different from what they told the researchers in their answers to a previous question. It also would be interesting to reverse the order, and ask subjects the vulnerability question first and then follow it with the objective probability question. Dr. Windschitl agreed that this would be an interesting experiment, and that for purposes of measurement (e.g., on a survey), these questions would work best if they ask about a variety of risks, and when the first two questions are basically “filler” items to get subjects used to always being asked two questions. This also raises their awareness of the need to separate out intuitive feelings from objective beliefs.

Dr. Flynn expressed concern about the difficulty associated with asking subjects for their assessment of objective probability followed by a second question that seems to say “now tell me what your real answer is,” so a different time frame might be needed for the two questions to measure different constructs. One possible frame for that objective probability would be to ask about “people like you” instead of asking for subjects’ personal susceptibility or vulnerability. Dr. Windschitl explained his belief that in many circumstances, there are cases where subjects do have different responses on the two measures, and that having the filler items in front and getting subjects used to that may help them to separate out their two types of responses.

Dr. Rimer noted that individual differences are ignored in many large-scale population surveys. One interesting finding is that in studies of genetic testing and mammography behavior, women who were depressed were more likely to give accurate assessments than non-depressed women. As experts are better able to give individuals realistic numerical probabilities of disease risks, how will this affect subjects’ perceptions as well as the measurements? Dr. Windschitl explained that when subjects are given a numeric piece of information embedded within various non-numeric forms of information on an objective likelihood measure, they generally focus on the numeric information to provide their response, and they might actually believe that that numeric information is quite valid and appropriate for providing their response on the objective likelihood scale. On the intuitive feelings scale, however, the non-numeric information will lead subjects to depart from what they responded for the numeric measure. In other research, Dr. Windschitl and associates have shown that if one piece of numeric information is provided and subjects are given a way to evaluate that information relative to some other piece of numeric information, there also is a “risk ladder” concept, in which the comparison of numerical risk for one disease versus another could drive subjects’ feelings. If subjects are given only one number,

it often is meaningless unless they are provided with a comparison point against which they can evaluate the number.

Dr. Weinstein noted that there are data suggesting that when subjects are given personalized numerical information and they say they understand it and they think it is credible, they still give different answers when asked about their personal risk. Even when asking for an objective probability, it is possible that subjects' vulnerability feelings are overcoming what they are being told. Dr. Millstein described an infertility study in which participants were asked to tell researchers what their doctors told them about their chances of conceiving. Participants then were asked about what they thought their chances were, and the results (anecdotal evidence) indicated that participants tended to report believing their chances of conception were higher than the chances given to them by their doctors. She asked Dr. Windschitl to discuss the stability of these measures and, in particular, the stability or instability of the intuitive assessments or perceptions. Although there are no data, Dr. Windschitl noted that the intuitive perceptions are likely to vary, even from hour to hour, if the right kind of information is given to subjects. For example, an individual's sense of the objective risk of being a victim of terrorism may be constant, but depending on what news they are watching, their intuitive perceptions may vary dramatically. Dr. Millstein also asked to what extent intuitive perceptions are fueled by emotion. Emotions vary second by second, and emotional states may vary by minutes. How can these be measured?

Dr. Slovic said that with regard to the stability and reliability of these numbers, feelings and emotions clearly bounce around and are very labile. On the other hand, attitudes have an important emotional or feeling base to them and can be remarkably stable, so an attitude towards some hazard can be unvarying over years despite new information. Therefore, it is a complex system. In terms of eliciting numerical probabilities, Dr. Windschitl's work demonstrates how sensitive the system is to the context of the question. Other research has shown that both empirically and theoretically, the judgment of a probability of an event depends not on the event, but on the description of the event. There can be equivalent descriptions of the same event that can elicit vastly different probabilities (e.g., what is the probability that you will get cancer from smoking?). This shows that the likelihood is not represented numerically for the most part, and that individuals tend to construct a likelihood in response to the way that the question is presented. Dr. Windschitl explained that there is an internal representation of beliefs and an internal representation of intuitive feelings. The reports of beliefs—even objective beliefs—can vary dramatically depending on the context. Both the internal representation of beliefs and the internal representation of intuitive feelings can move up or down when subjects are asked to report them. Belief and objective probability likely tend to be more stable, and generally are not well represented in a numeric fashion.

Dr. Hay asked if the intuitive, "gut" reaction might come through more on the visual scales if a series of faces with different expressions or a matrix of a large number of characters for subjects to choose from was used. It appears that intuitive feelings come out much more quickly when subjects are given something visual, as opposed to numerical or verbally anchored scales. Dr. Windschitl agreed that these kinds of measures are more sensitive to intuitive reactions, and noted that for any given scale, researchers should question whether subjects are considering the objective probability, or whether it is a strictly intuitive perception.

Dr. Cappella commented that it would be interesting to study the extent to which an optimism bias that might take place for some subset of individuals is associated with certain ways of thinking about a problem, compared to a pessimism bias where they react in the opposite direction. Dr. Croyle noted that the time frame is critically important. Research on anticipatory pessimism shows that as individuals approach an event of uncertain outcome, they often become more pessimistic as the event draws closer. As an anticipatory coping strategy, people often assume the worst before they get the news (under medical testing circumstances) to brace themselves, so they are adjusting their objective probability to regulate their affect and the anticipation of how to cope with a potential negative outcome.

Risk Perceptions: A Self-Regulatory Perspective

Linda D. Cameron, Ph.D.

Senior Lecturer, Department of Psychology, University of Auckland

Discussion

Dr. Cappella commented that if it is true that risk and worry accounted for behavior completely with some simple measures (from the point of view of intervention), then the same levels of risk or the same levels of worry might be produced by very different kinds of representational systems. If the interventions depend on the way in which individuals represent risk and worry to themselves, then researchers need to know the risk and worry. He asked whether Dr. Cameron and colleagues had been able to study subgroups in their populations of interest to establish not just different levels of risk and worry, but also different representational systems behind those levels of risk and worry. Dr. Cameron agreed that for the sake of interventions, researchers do need to be able to address representational beliefs. Even if investigators can predict behavior based on risk and worry, for intervention's sake they have to look at the illness representations. She reported hoping to conduct future research on a data set that includes subjects' risk judgments and worries and assesses illness risk dimensions to determine their relative contributions. There is an extensive body of literature that examines how illness representations predict behavior. However, this research has not examined how those representations link to risk perceptions and worry, and how that in turn links to behaviors.

Dr. Croyle asked about the order of the causal pathway, because representations and risk perceptions often are determined by behavior. Behavior usually comes first, and then people keep moving their risk perceptions and representations to conform to their prior behavior. Often, the effect size of behavior on the cognition is significantly larger than the effect size of the risk perception on behavior. In other words, it is easier to show a strong effect of behavior or consequence on cognition than if cognition is used as a predictor. He also asked, within the context of the self regulation model, about the mental models as adapting or changing as a consequence of behaviors, because some people view that as a motivational process, but new behaviors are also new information, so it could be viewed as a defense bias or ego motivation (each time an individual engages in a new behavior, he or she also is adding to the information they can incorporate into their mental model).

Dr. Cameron noted that future behavior is conditional upon having the opportunities, other situational constraints, etc. Another important issue with this model is that although it demonstrates how illness representations are promoting behavior, the behaviors that are being promoted often are not the ones that researchers are interested in (e.g., individuals at high risk for heart disease may decide to cope with that by increasing their vitamin E intake because they somehow believe that taking vitamin E will reduce their risk, while researchers would be interested in whether these individuals are changing their fat intake or exercising). It also is important to consider the “if...then” beliefs that people have and how representations depend on the manner in which individuals evaluate their past behaviors.

Dr. Rimer reminded participants of the need to measure worry more comprehensively. In studies of breast cancer, researchers ask about worry and find a very small proportion of women who say they are worried, primarily because breast cancer does not appear to be “believable” to them. This may be a response problem, because women generally say they are “concerned,” not “worried” about breast cancer. There is a need to find ways to measure worry. She asked whether different kinds of interventions would be needed for people with trait anxiety. Dr. Cameron stated that it will be important to tailor interventions so that they target the needs of highly anxious women. Highly anxious women may need more attention to emotion regulation processes and how they process those emotions in ways that will lead to protective behavior compared with low-anxious women.

Dr. Hay noted that Dr. Cameron’s model appears to show that illness worry and risk perceptions are partially overlapping and are promoters of behavior. She asked how the model relates to the Curvilinear Hypothesis with regard to perceived risk. Researchers generally do not consider very high levels of risk as being inhibitors, but with cancer or illness worry there is a hypothesis in the literature that very high levels of cancer worry inhibit behavior change in some individuals. Dr. Cameron described some conflicting findings in the literature regarding the curvilinear relationship. Some researchers have demonstrated that there is more of a linear relationship, which could be due to an examination of behaviors that are somewhat put off in time and do not require immediate action (e.g., women have time to prepare themselves emotionally for a mammogram). Researchers also have found that extreme worry can lead to an avoidance response, at least in the short term, and this likely is a timing issue.

Dr. Croyle explained that an ongoing methodologic and theoretical controversy in the health domain is the generality of processes and principles of health cognition across disease domains. Many of the applications of psychology to the health domain do not incorporate a consideration of the specific features and characteristics of a particular illness context, and therefore are not effective (e.g., they do not measure people’s beliefs and representations about other features and signs of the illness). He asked Dr. Cameron, within the context of risk perception and measuring perceived risk, about the most critical features of her model that will vary across diseases and that need to be measured to have a better measure of perceived risk. Dr. Cameron noted that it is important to identify that there will be domain specificity across the diseases, so that the important representational attributes for breast cancer may be very different than the important representational aspects for lung cancer. For lung cancer, the causal belief that smoking causes lung cancer is going to be critical, possibly even the sole predictor of risk perceptions and behavior. For breast cancer, the causal beliefs cannot be controlled and it therefore is more

important to focus on controllability in terms of early detection and surgery. Dr. Croyle added that the weight of the different dimensions of the representation may vary across the diseases.

Dr. Millstein commented that it is not just the situations in which one pathway versus another pathway might be dominant. Individual differences, particularly developmental differences, may be important. Dr. Abrams explained that when researchers induce a condition artificially in the laboratory, it relates to this dimension of ecologic validity, and it is not surprising that some type of internal reduction in a natural real world would be quite different from an artificial induction in a laboratory. In his own research, he has found that when smokers are given the sight and smell of their favorite cigarette in a high-risk situation, it makes a tremendous difference whether the subjects are in treatment for quitting or whether they have no interest in quitting at all. Situational dimensions dramatically modify experimental outcomes, he added.

Origins and Functions of Perceptions of Risk

Elke U. Weber, Ph.D.

Professor, Department of Psychology, School of Business, Columbia University

Discussion

Dr. Weinstein asked for some examples of measures used by Dr. Weber and colleagues to assess affect, feeling, or other similar constructs. Dr. Weber explained that there are a variety of approaches, and she provided an example from research on individuals' financial investment decisions. Subjects may be asked to rate on a scale from 0 to 100 how worried they are between the date of buying a stock and finding out what the outcome will be. Subjects typically are given anchors for the upper and lower bounds (they are shown the most risky and least risky options in terms of variance). Dr. Windschitl asked whether Dr. Weber and colleagues conducted an analysis of individuals who recently selected a bad card from the deck, asking them questions about how they felt or studying how they reacted differently from people who selected a bad card further in the past. Dr. Weber replied that they did not ask these individuals for their emotional reactions in the initial study. However, she and her colleagues currently are analyzing the group reactions (e.g., how many people picked the "sure thing" as a function of the probabilities and the outcomes). When people learn outcomes by experience, on average they will underestimate the probability of rare events, partly because of the updating process and partly because some of the time there is an asymmetry in the occurrence of key events (e.g., by chance alone, a few individuals will see a rare event quite often).

Dr. Slovic noted that Dr. Weber's work is a vivid demonstration of the difference between the description utility and the experience utility. Her work could be used to predict preference as well as satisfaction with a decision. Another key concept is that one would expect that the insights gained about preference from the experience would be much more lasting and useful in terms of post-decision satisfaction than the description utility. Dr. Slovic also explained that neuroscience research has shown that some of the brain pathways that lead to emotion are linked to action; the motor neuron and feeling neurons somehow have linkages, and it may be that when the feelings are aroused, the brain is wired for one response and that satisfies the concern. Dr.

Weber added that it would be interesting and helpful to demonstrate that there is some sort of negative feedback loop that cancels out or responds adequately.

When asked about the experience-based effect, Dr. Weber explained that people process information about probabilities differently. In general, people do not pay as much attention as they should to probabilities because they are more focused on the outcomes, which is one reason researchers overweight rare events with descriptions. She briefly described the following three components of experience related to a rare event: (1) individuals do not experience a rare event, and if they do not experience it, they do not worry about it; (2) even if an individual experiences a rare event, they experience it less on average than expected; and (3) if an individual experiences a rare event exactly in proportion to its objective probability, they still tend to overweight more recent experiences, and rare events are less likely to have been recent experiences.

Dr. Cappella noted that it is a challenge to try to take research on probability information acquired through learning and apply it in a domain where in the real world, there is not an opportunity to sample a series of events. For example, with regard to catching a cold, there are a variety of actions individuals can take to avoid catching a cold (e.g., washing hands, staying away from people with colds). However, for other types of threats, individuals cannot acquire probability information from learning (e.g., because the event is extremely rare). How does one take these results and apply them in domains where there is not a repetition of events or where there is a low rate of the event occurring and individuals cannot learn from experience? Dr. Weber explained that in these situations, people may make decisions based on descriptions. Dr. Cappella suggested adding to Dr. Weber's experiment by including descriptions of real people with real medical conditions on the cards rather than having people just draw yes/no cards. This approach may add a significant degree of reality for study subjects.

Dr. Cameron asked about the single-action bias in the health domain. There are a number of illnesses or conditions that require multiple behaviors, like diabetes (controlling insulin, exercising, diet, etc). Are there any examples of single-action bias in the health domain? Dr. Croyle offered the example of exercise, where there are many activities one can participate in (e.g., walking, running, etc.). An individual who thinks that he or she needs to be more physically active might join a health club. They may never go and exercise, but they feel as though they have taken a sufficient action because they joined the club. Dr. Weber added that physicians generally are not very good at diagnosing multiple diseases in a single patient—one study of radiologists found that when they examined x-rays that showed multiple medical problems, they tended to identify one problem—not necessarily the most obvious problem—and not the others.

Dr. Windschitl noted that there probably is a significant egocentric bias as well. Individuals should pay attention not only to their own experiences, but also the information they have about their friends' experiences, who are participating in the same behaviors as the individual. It is likely that people vastly overweight their own experiences. For example, if an individual has done something 10 times and has not suffered negative consequences and their friend has the same behavior and has suffered the negative consequence, the individual tends to discount their friend's experience and operate from their own experience. Although providing people with

information about others' experiences would help, it has to be made salient enough because there will be an inequality of the impact of personal experiences versus the experiences of others.

Dr. Greenwald explained that when people respond to the question about the probability of their getting lung cancer, their experience of past probability of getting lung cancer is zero, so they are not using that for the basis for answering the question. If they think about acquaintances who smoke, they probably know very few who have lung cancer. Dr. Weber added that individuals are probably using a combination of their personal experience as well as information that has been highly publicized. The fact that individuals do not have lung cancer when asking themselves about the risk of getting lung cancer is likely to contribute greatly to the subjective underestimation in certain situations.

Dr. Croyle asked where the social comparative aspect of risk fits in. Dr. Weber explained that she would include it in the description-based category. Dr. Croyle also asked whether Dr. Weber had examined the actor/observer paradigm, in which the actor uses the cards while another individual observes him or her. Dr. Weber responded that she had not, but other researchers have found a significantly reduced impact associated with observing other individuals.

Dr. Abrams asked whether an aspect of the underlying neurocognitive processing can be related to a more appetitive approach reward circuitry as opposed to the fear/inhibition circuitry. This likely is another part of this complex interaction, partly because some of the behaviors are motivated by appetitive reward, which also is hard-wired into survival. Furthermore, because some of the coping responses need to be activated, the action plans would come more from an appetitive seeking as opposed to a void. Is there a role for the positive reward circuitry in risk decisionmaking, and if so, what is that role? Dr. Millstein commented that the rational decisionmaking models in the decisionmaking literature address the risk-benefit equation, that is, the rational system. The closest parallel in the experiential system might be some work that has been done on conflict, the experiential version of combining risks and benefits. Dr. Rimer added that this literature influenced a number of researchers studying mammography to try to understand women's individual accounting systems of risks and benefits. A number of successful interventions were developed as a result of these efforts, but it may be time to reexamine this work in a more sophisticated manner.

Dr. Slovic noted that the October 2002 issue of the journal *Neuron* was devoted to the brain and decisionmaking. One of the articles raises the question of how the human brain rapidly integrates diverse and incommensurable inputs. The paper identifies the dopamine neurons as an integrated mechanism. On a higher level, the affective or the feeling system may be driven by these neurons. Dr. Abrams noted that there also is the issue of not knowing what anxiety is, because it is an old construct from medical models of how the brain works, based on old-fashioned views of symptoms of an abnormal behavior. It is not surprising that there are unexpected results when studying mood, anxiety, depression, etc. Researchers are not mapping in accordance with the current understanding of how the brain works, but rather are using old categories from the 1950s to map emotions.

Affect, Risk, and Decisionmaking

Paul Slovic, Ph.D.

Decision Research

Discussion

Dr. Croyle noted that in terms of confounded costs and benefits, there has been a great deal of discussion about affect, but this discussion has presumed an old model, a bipolar unidimensional negative model, as opposed to moderately independent dimensions of positive-negative affect. He asked whether Dr. Slovic had considered this in the context of his research. Dr. Slovic explained that even if, neurologically, there are two separate channels for positive and negative affect, at some point they have to blend, and individuals must decide whether the positive is more appealing or the negative is more aversive. He likened this phenomena to a bipolar scale. Dr. Croyle commented that this explanation presumes that people do not experience chronic ambivalence (i.e., when people are paralyzed by indecision). Dr. Slovic explained that chronic ambivalence has not been well studied by decision analysts and researchers.

Dr. Greenwald commented that it might not be necessary to regard the bipolar and the orthogonal views of affect as incompatible with each other. For example, one could hold the orthogonal positive and negative dimensions idea and assume by an intentional mechanism that they cannot possibly both control behavior at the same time, so if an individual is focusing on one at the time they act rather than the other, then he or she has reduced it to a bipolar function in order to act.

Dr. Millstein added that different emotions have different neural pathways and different ways of operating, and that there also are mixed states. Technically, these are brief moments of time, and what really characterizes feeling at a given moment generally is a mixed state, not a pure state. Therefore, the more simplistic positive/negative affect dimensions do provide a great deal of information. For example, stress may be a mixed state: is it fear, is it anxiety, is it both, or is it something else? Most of the real-life situations that researchers are able to study outside of a specialized laboratory are mixed states, and this may cover a lot of the variance.

Dr. Croyle likened the health domain to the relationship domain, in that ambivalence is the typical stage. Although everyone knows it is good to be healthy, there are a variety unhealthy behaviors people undertake. Similarly, in relationship research, experts use positives and negatives (e.g., "I like this," "I do not like this," etc.), which is why in many cases health behavior researchers apply the decision model to a particular study, using it as a measure of mediators of an intervention to change a behavior. It results in a total score that is positive or negative, but that positive or negative number never seems to capture the complexity of the state of ambivalence. Dr. Slovic added that when a person does not do something, they have resolved their ambivalence and acted on it. Dr. Croyle noted that this concept applies well to health domains where the issue is acting or not acting (e.g., getting a mammogram or not getting a mammogram), but it does not translate as well to chronic daily behavioral habits that occur as an ongoing process. Dr. Slovic replied that this involves representations of the problem and a cumulative aspect (e.g., having a rich desert one time will not have an adverse health effect, but having a rich dessert with every meal will).

Dr. Rimer explained that she added an item on ambivalence to some of her studies on mammography (to measure being torn between having and not having a mammogram). For women who were not adherent, ambivalence was a very strong predictor, and should be considered for future studies. Dr. Rimer asked about the value of trying to shift people's perceptions about the time frame in which they experience the consequence. Smokers tend to think that lung cancer will not occur until a very old age; yet a significant proportion of lung cancers are diagnosed in middle age. Dr. Slovic noted that time characteristics and the perception of time is very important, although moving up to middle age may not make any difference to a teenager who thinks they will stop smoking within a year of starting. Most smokers are planning to quit, and when asked about when they expect to quit, most report expecting to quit within 1 year, so their time horizon is very short. Furthermore, they tend not to appreciate the likelihood that they will not be quitting within 1 year. A large body of data indicates that smokers' expectations of when they are going to quit are vastly optimistic. Another aspect is telling smokers that smoking, on average, will take 10 years off of their life. But to a 16- or 17-year old, there is little appreciation for the difference between dying at age 70 or at age 80.

Another associated problem, according to Dr. Cameron, is that adolescents may not have a good idea of who they are going to be 10 or 20 years from now, they do not have a timeline for themselves. They realize that cigarettes can cause lung cancer at middle age, but they cannot imagine themselves at middle age. An impact might be made by showing a teen-aged smoker a picture of themselves that has been aged 10 or 15 years, this may give them a concrete sense of what they will look like and how these issues might relate to them.

Dr. Slovic commented that in many of these domains, particularly smoking, alcohol, and with certain types of foods, there is another side that is deliberately trying to manipulate images and perceptions. For example, the tobacco industry knows what images appeal to young men and women of different races, they study this, and they tune their messages to appeal to people. They are trying to create a desirable image and show how their product will lead people to this desirable image. It is not just that people are stumbling into this type of behavior, they are being manipulated into it through an industry that is very smart and has massive resources. Dr. Rimer noted that there is a subset of people who have many unhealthy behaviors. For example, women who do not get mammograms are more likely to smoke, to not have other kinds of screening tests, and to eat bad diets. These people have many risks and presumably are not adhering to many different health-related messages. She expressed belief that individuals do not have the ability to weigh multiple risk messages simultaneously about very different behaviors and risks.

Dr. Croyle noted that there is a small subgroup of people who account for many of the risky health behaviors, and that subgroup is not included in most studies. Furthermore, there seems to be a substantial qualitative difference in how information is utilized in this subgroup, and they may perceive risks in very different ways. Dr. Weinstein asked whether the reactions discussed by Dr. Slovic are affects about threatening issues or global value judgment evaluations, and whether that is an important distinction. Dr. Slovic replied that it is a general notion, it is positive and negative feeling states that often are very faint, and they can be triggered by analysis. An individual can analyze something and come to the conclusion that X is better than Y and therefore have more affect, but the characteristics of X evoke almost a conditioned

response, much of which can be below the individual's awareness. He compared these little charges of positive and negative feeling to electrons and neutrons, noting that neuroscientists in the future likely will be able to show that these positive and negative feelings being demonstrated in behavioral studies can be seen to be operating at the level of the neuron.

Summary Discussion

On behalf of the National Cancer Institute (NCI), Dr. Croyle thanked participants for attending the workshop and asked for feedback and ideas on next steps to followup the workshop. Specifically, he asked for suggestions for future meetings, additional participants, and other fields of expertise that should be included. He asked what the NCI could do to facilitate work and advance research knowledge, understanding, and synthesis in this area so that the broader research community can benefit from the discussions at this workshop. Dr. Weinstein noted that he will meet with Drs. Millstein and Gerrard to discuss future directions as well.

Dr. Weber proposed inviting Jennifer Lerner at Carnegie Mellon University and Tory Higgins at Columbia University as participants for a future meeting or workshop. Dr. Rimer suggested adding Richard Petty resistance to persuasion as well. He and his colleagues have been conducting research that may help to explain people's responses to risk information. She also noted that this field should pay more attention to the cutting-edge persuasion literature.

Dr. Rimer described an ongoing national population survey, the Health Information National Tends Survey (HINTS), which interviews 7,000 individuals via telephone. The survey includes individuals aged 18-75, and oversamples minorities. There might be some opportunities to include some multiple measures of risk, as well as some measures of worry in a future version of HINTS. Dr. Weinstein added that this biannual survey was designed to include modules for special purposes, including embedding experiments within the survey. Data from the most recent HINTS survey will be available in a few months. Dr. Weber requested that the results be sent to workshop participants. Dr. Vishwanath agreed to send the information out when it becomes available, and noted that the data, questionnaire, and other materials also will be made available on the Internet.

Dr. Millstein voiced support for another "brainstorming" workshop such as this. There is a group of researchers who use risk perception measures but do not know where to go for information on these measures or how to use them most effectively. It would be helpful if workshop participants could generate a document intended for this audience. Dr. Weinstein agreed that it would be useful to have the group, or a subset of volunteers from the group, develop a report for individuals who want to examine at risk perceptions more in depth and incorporate some of these questions into their research. Dr. Cameron suggested meeting in another 8-12 months to allow participants to come back with significant, new contributions.

Dr. Cappella noted that there has been a tremendous amount written on the idea of a basic singular measure of risk and whether it has some relationship to behaviors across a variety of target behaviors. There also is evidence suggesting that these measures fail. He asked if any meta-analyses exist that could clarify this situation. Dr. Weinstein replied that there are no such

existing meta-analyses. He added that some component of this contradictory character is due to the presence of many cross-sectional studies that incorrectly analyze the data and therefore would not be included in meta-analyses. It is hoped to conduct this type of study in the future. Such a study will have to start with domains for which there is a large enough literature base to conduct the subanalyses. Dr. Rimer added that there is a lack of consistency in this field, and measurement problems have impeded the creation of this literature.

In terms of future activities, Dr. Greenwald stated that it would be helpful to list the major questions that need to be answered to follow up the agenda that was started at this workshop. Smoking and risk of lung cancer appears to have been chosen as a model system for researchers in this field. Is this a good model? Can it be expected to generalize to other areas of health risk? There is a good deal of correlational knowledge about how measures that are being used (e.g., behavioral intention, risk measures, etc.) work, but there is a gap in predicting the target behavior, so there must be some questions related to linking up the research and the measures with the target behavior. Furthermore, are the rule-based and associative-based, or the rational and experiential systems, and the measures based on them enough to predict behaviors of interest?

Dr. Cappella noted that smoking, which becomes habituated physiologically, may have a genetic component associated with propensity to addiction, so there should be some concern about the pathway for the maintenance of the behavior. He added that some behaviors have a social component to them—this has been absent from discussions at the workshop. Specifically, there may be a social component to the communication of worry, particularly among people who feel at risk of a particular disease and whether they seek out family advice or spend time talking to professionals, and more importantly, whether they talk to other people. Other people's worries, which may be misapprehensions, are communicated and could lead to a spiral of misperception that is communicated. He described a study that he and his colleagues recently completed, in which a cohort of high sensation-seeking and low sensation-seeking adolescents viewed a series of anti-drug advertisements. These teens then were broken out into groups and participated in electronic "chats" with each other. The investigators found a boomerang effect in that teens who spent time chatting with each other developed stronger pro-drug attitudes. Teens who disliked that advertisements tended to be the high sensation seekers and were more expressive. By virtue of being more expressive, they communicated their dislike of the advertisements and created more pro-drug attitudes among the low sensation seekers. In conceptualizing risk rather than understanding the pathways to risk, this is a potential social pathway that is worth including.

Dr. Cameron agreed, noting that it would be an excellent topic for a future meeting. How to directly or appropriately measure risk to predict behavior depends on the specific illnesses, the other kinds of factors that may be influencing behavior, the fact that peoples' risk perceptions may be linked to completely different behaviors, and many other factors. There are many components that researchers need to understand about the risk-behavior link that will then feed back to inform them on how to assess it in different kinds of contexts. Dr. Slovic commented that one focused future direction would be for workshop participants to come to a consensus regarding the pitfalls of working with elicited probabilities in this domain. Additionally, to know whether the concept of risk is useful in a particular domain, the behaviors must be understood better, which will require more research. There are serious problems associated with eliciting

numerical probabilities from study subjects, and alternate ways to communicate risk probability are needed.

Dr. Millstein noted that one compelling question for future research involves the developmental nature of risk judgment, risk perception, and vulnerability. For example, there is a belief about adolescents having a sense of invulnerability; whether or not it is a developmental phenomenon is not clear, and there is conflicting evidence. If the experiential and rational systems work in parallel and converge in adults, does this hold true in adolescents? Is one system moving ahead of the other in different age groups? This would have significant implications for the development of interventions. Dr. Masse noted that it is difficult to develop standardized scales and measures across different age groups—the same scales do not work in adolescents and young adults. Advanced psychometric methods potentially could be used that involve core items that allow researchers to make comparisons while at the same time allowing flexibility for specific items for certain groups. This will require identifying core items and reformulating scales. Dr. Flynn agreed, emphasizing that the adolescent situation poses a significant challenge to the concept of risk. Researchers in this field need to start thinking in multidimensional terms because health risk consequences of behavior for adolescents are of minimal importance. The social acceptance or rejection consequences of behavior might be more important.

Dr. Weinstein asked how to measure whether a risk seems “real” to individuals. Dr. Slovic replied that risk creates a negative feeling, and requires a tinge of anxiety or backing away from something. The reality is the level of this feeling. Dr. Greenwald added that one way to establish whether a risk is “real” is to determine whether it is associated with self. If individuals mentally associate a risk with self, then it should be considered as real.

Dr. Windschitl noted that the workshop did not include a discussion on the consequentialistic version of the antecedents of a behavior versus the nonconsequentialistic (e.g., whether behaviors are preceded by decisions that people make or whether they are preceded by something that would not normally be considered a decision). Dr. Weinstein noted that risky behaviors may be very different than precautionary behaviors, which may have a larger decision component to them. Dr. Cappella explained that there are many examples of adolescents making judged decisions to use alcohol, drugs, etc. Data on adolescents and marijuana use suggest that teens make very sharp distinctions between trial and regular use. They see very clear positive consequences coming to them as a result of drug use. The social consequences for high-risk teens are reported to be much more positive than for the low-risk teens. Dr. Slovic commented that if a teenager has adopted a behavior and then is asked to explain why they have adopted this behavior, they may not necessarily have an insight into what really was motivating that behavior.

In closing, Dr. Weinstein again thanked participants for attending the workshop. Before adjournment, he also asked that they forward to him any ideas for future activities to advance the discussions from the workshop.