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ORIGINAL ARTICLE

The Role of Anxiety in Seeking and Retaining Risk Information: Testing the Risk Perception Attitude Framework in Two Studies

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Despite the importance of health information seeking, not all people engage in such behaviors, especially when thinking about the disease is distressing. The focus of this paper is to examine the antecedents of information seeking and retention. Based on individuals' risk perception and efficacy beliefs, the risk perception attitude framework is used to formulate four groups: responsive (high risk, high efficacy), avoidance (high risk, low efficacy), proactive (low risk, high efficacy), and indifference (low risk, low efficacy). In Study 1, a 2 (risk) × 2 (efficacy) between-subjects experiment, participants' perceived risk to skin cancer and skin cancer–related efficacy beliefs were induced to determine their information seeking, retention, and intentions to engage in future seeking. The responsive group, as predicted, was associated with the most information-seeking behaviors and information-seeking intentions. The avoidance group, however, sought information but exhibited the lowest retention scores. These results were used to derive two predictions—the incredulity hypothesis and the anxiety-reduction hypothesis—that were then tested in Study 2. Study 2, also a 2 (risk) × 2 (efficacy) between-subjects experiment dealing with diabetes, found support for the anxiety-reduction hypothesis, which argues that the high-risk, low-efficacy group experiences more anxiety, which leads to high motivations to seek, but lower ability to retain information.

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Information seeking is emerging as an important topic of communication scholarship, as evidenced, for example, by a special issue devoted to the topic by this journal (*Human Communication Research,* Volume 28, No. 2) in 2002. Health communication scholars are asking questions about the role that individuals' information-seeking behaviors play in their overall health and well-being (Brashers, Goldsmith, & Hsieh,

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2002), how interventions can motivate individuals to seek information on their own (Rimal, Flora, & Schooler, 1999), and the extent to which information seeking is a demonstration of patient autonomy (Dutta-Bergman, 2005). People may want to seek information to understand diagnoses, decide on treatments, or help make prevention decisions (Brashers et al., 2002). Given the complexities of most chronic diseases (e.g., cancer, diabetes, AIDS), it may be advantageous for patients to seek additional information—beyond what they typically receive in a physician's office—in order to gain an in-depth understanding of the topic. Encouraging patients to seek additional information on their own, in fact, constitutes an important strategy underlying many public service announcements. Little is known, however, about factors that promote information seeking, as this construct, until recently, has not been thought of as an important health behavior. Furthermore, researchers have not examined whether, or under what conditions, enhanced information seeking results in greater information acquisition and retention. The focus of this research is to examine the antecedents of information seeking and retention.

Rationale

Information seeking

Although health-related information seeking can lead to a deeper understanding of disease symptoms, prevention tactics, or effective cures, people are not always motivated to seek such information on their own. In fact, research indicates that people often avoid information seeking when the topic is distressing (Brashers et al., 2000) or when it conflicts with their belief system (Babrow, 2001; Zillman & Bryant, 1985). Yet, evidence from large public health trials, including the Stanford Five-City Project (Winkleby, Flora, & Kraemer, 1994) and the Minnesota Heart Health Program (Viswanath & Finnegan, 1996) indicates that information seeking and retention of knowledge can result in positive health outcomes. When health campaigns motivate individuals to seek information on their own, effects of the campaign in changing individuals' behaviors typically outlast the duration of the campaign itself (Rimal et al., 1999).

Yet, little is known about the antecedents of information seeking and the relationship between information seeking and retention. As Brashers et al. (2002) note, it is important to determine if information seeking (and avoiding) is a function of ability or of motivation. If individuals are both able and motivated, they may actually seek more information, but seeking and consuming more information do not necessarily lead to information retention, especially if information-seeking behavior occurs under conditions of perceived risk. One framework that makes specific predictions about information-seeking behavior is the risk perception attitude (RPA) framework.

The RPA framework

The RPA framework (Rimal & Real, 2003) posits that the effects of risk perceptions have to be considered in the context of individuals' efficacy beliefs. Although many primary studies as well as meta-analytic data have shown perceived risk to be a motivation for behavioral action (Rogers & Prentice-Dunn, 1997), attempts to establish a causal relation between risk perception and health behavior have led to confusing and even contradictory results. Some studies (Dolinski, Gromski, & Zawisza, 1987; Larwood, 1978; Weinstein, 1982, 1983; Weinstein, Sandman, & Roberts, 1990) have found a positive correlation, others (Joseph et al., 1987; Robertson, 1977; Svenson, Fischhoff, & MacGregor, 1985) have not, and still others (Svenson et al., 1985; van der Velde, Hooijkaas, & van der Pligt, 1991; Weinstein, Grubb, & Vautier, 1986) have found a negative correlation. Two primary limitations of past research, one methodological (most studies are based on correlational data) and the other conceptual (that the translation of risk perceptions into behavioral action requires strong efficacy perceptions), have been cited as reasons for the contradictory findings (Rimal, 2001).

We test the central proposition of the RPA framework to determine whether, and if so how, the relation between risk perception and information seeking can be better understood by considering efficacy beliefs. The RPA framework posits that when risk perceptions are low, people rely on efficacy beliefs to determine an appropriate course of action. Feeling confident about one's ability to enact a particular behavior and believing that enacting the behavior will result in positive outcomes—characteristics of those with high-efficacy beliefs—tend to motivate people to initiate challenging tasks, set realistic goals, persevere in the face of setbacks, and restructure their social environments to make them conducive to healthy behaviors (Bandura, 1986, 1995). In fact, efficacy belief has been found to be one of the most reliable predictors of behavior across a variety of domains, including drug use (Hays & Ellickson, 1990), sexual activity (Jemmott, Jemmott, Spears, Hewitt, & Cruz-Collins, 1991), smoking (Lawrance & Rubinson, 1986), and weight loss and diet (Glynn & Ruderman, 1986).

Bandura (1982, 1983, 1999) conceptualized self-efficacy as individuals' beliefs in their capabilities to mobilize the motivation, cognitive resources, and agency to exert control over a given event. It is the belief in one's capabilities to produce a certain outcome or goal that is seen as the foundation of human agency (Bandura, Pastorelli, Barbaranelli & Caprara, 1999).

Efficacy beliefs regulate human functioning and emotional well-being through cognitive, motivational, affective, and selective processes. When facing adverse events, those who retain the belief that they will be able to exert control over their thoughts are more likely to persevere in their efforts. Those who are self-efficacious are also more likely to reject negative thoughts about themselves or their abilities than those with a sense of personal inefficacy (Ozer & Bandura, 1990). Thus, unless people believe they can produce desired goals through their actions, they will have little incentive to persevere in the face of difficulties. Presumably then, self-efficacy would be an important factor in the development of competence when facing adversity. Perceived self-efficacy likely affects individuals' ability to adapt and deal flexibly with difficult situations, and also affects individuals' aspirations, analytical thinking, and perseverance in the face of failure (Bandura, 2001; Maibach & Murphy, 1995).

Efficacy beliefs also comprise outcome expectation (also called response efficacy), defined as the belief that enacting a specific behavior will result in the changes one seeks (Bandura, 1977). People with greater response efficacy are able to translate knowledge into behavior (Rimal, 2000), they persevere in the face of barriers, they construe failure as the consequence of not expending adequate effort (as opposed to a demonstration of their lack of ability, which is characteristic of those with low efficacy), and they tend to derive greater confidence from behavioral accomplishments, rather than interpret success as the consequence of chance or good luck (Bandura, 1986). Although meta-analytic data regarding fear appeals (Rogers & Prentice-Dunn, 1997; Witte & Allen, 2000) are consistent with a main effect of efficacy (and of risk) on attitudes, intentions, and behaviors, studies have not systematically examined the impact of efficacy on information seeking and retention.

When risk perceptions are high, efficacy beliefs take on added importance because the heightened levels of personal risk not only act as motivational factors but also tend to generate anxiety (Witte, 1994). When individuals feel anxious about their well-being because they perceive that they are at risk to a particular disease, their perceived ability to avoid the disease plays a critical role in how they decide to behave (Witte, 1992). At heightened levels of perceived risk, lower efficacy tends to generate counterproductive, and higher efficacy tends to generate risk-reducing, behaviors, as has been found in both field-based (Rimal, 2002) and experiment-based (Witte, 1994) studies.

According to the RPA framework, audiences' risk perceptions and efficacy beliefs can be used to form four distinct attitudinal groups or clusters. Individuals with high-risk perceptions who also possess high-efficacy beliefs are classified as the *responsive* group. Due to heightened awareness of their risk status and believing they have the requisite skills to avert the threat of the disease, the responsive group has been hypothesized to actively seek health information and practice healthy behaviors. The second group, those with high-risk perceptions and low-efficacy beliefs are labeled the *avoidance* group. Due to lower perceived ability, members of the avoidance group are posited to avoid information that makes their risk status more salient. This group is thought to be less motivated, and less knowledgeable. Individuals with low-risk perception and high-efficacy beliefs are thought to actively seek information that helps them avoid disease and are thought to be motivated by their desire to remain disease free. They are classified into the *proactive* group. Finally, those with low-risk perceptions and low-efficacy beliefs are argued to be less motivated to seek information; they are labeled the *indifferent* group. Hence, by clustering groups of people by their risk and efficacy perceptions, we can make useful predictions regarding their information seeking and retention behaviors, which is useful for audience segmentation purposes. Clustering groups of people is useful in that scholars can examine behaviors that are likely among attitudinally similar people (in this case, with similar levels of risk and efficacy) and compare them with attitudinally dissimilar people.

Although the fear appeal literature (Witte, 1992, 1994) makes similar predictions as the RPA framework, there are important distinctions between the two. The Extended Parallel Process Model (EPPM) is a theory regarding scare tactics. The EPPM makes clear predictions regarding how scare tactics should be developed and when they will be the most effective. Fundamentally, the EPPM is a theory about how individuals process messages (those that highlight either the high or low threat), whereas the RPA framework theorizes about how individuals' perceptions of risk motivate them to act. According to the RPA framework, individuals' perceptions of their own risk motivate them to act and their efficacy perceptions provide the requisite skills for taking action. In this paper, we use the RPA framework to make predictions about individuals' propensity to seek information. Additionally, we examine the impact that risk- and efficacy-induced information seeking has on retention of information.

RPA framework findings

Using cross-sectional as well as longitudinal data from the Stanford Five-City Project, Rimal (2002) showed that classification of individuals into the four attitudinal groups was predictive of their cardiovascular disease–related motivation, knowledge, and information-seeking behaviors. Furthermore, these relations were robust even six years after the initial classification of individuals into the four attitudinal groups. Contrary findings, however, have also been reported (Rimal & Real, 2003, Study 2). Rimal and Real's data indicated that those in the avoidance group actually sought as much information as other participants, but they could not or would not learn the information (as evidenced by low retention scores). These findings comprise the primary motivation for the current study. The purpose of this paper is to conduct another set of studies, modeled after Rimal and Real's design, to test the central propositions derived from the RPA framework. We report findings from two studies: Study 1 was conducted in the context of skin cancer, findings from which were used to derive additional predictions, which were then tested in the context of diabetes in Study 2.

The purpose of Study 1 was to test the predictions of the RPA framework in an experimental setting by inducing risk perception and efficacy beliefs. We also wished to expand the purview of the RPA framework by determining whether (a) information seeking would be affected by our inductions and (b) greater information seeking would predict greater retention of knowledge. Overall, a two-way interaction between risk and efficacy is proposed to impact information seeking, information retention, intention to seek further information, and behavioral intentions. This interaction term is used to create four clusters that represent the RPA groups. Based on Rimal and Real (2003), we predict that there will be statistically significant differences among the four groups in terms of the dependent variables. In particular, it is posited that *for all outcomes, the relative ordering of the four RPA groups is hypothesized, from most to least positive outcomes, as: responsive, proactive, avoidance, and indifference. This hypothesis can also be stated in terms of each group's contrast* *coefficient (see Table 1) depicting the expected differences among means*. The outcomes under investigation are information-seeking behaviors, information-seeking intentions, information retention, and behavioral intentions.

Study 1

Method

Participants

Participants (N = 137), who received extra course credit, were undergraduate students recruited from introductory communication classes at the University of Texas, Austin. Approximately 80% of students were female. Seventy percent of participants were White, 13% Hispanic, 9% Asian American, 3% African American, and 5% "other." The average age of participants was 20.8 years (SD = 2.45).

Design and procedure

The study design was a 2 (perceived risk: high or low) × 2 (efficacy beliefs: high or low) between-subjects experiment. Procedures adopted in this study were exactly those adopted by Rimal and Real (2003, Study 1). Participants were told that this was a "study about skin cancer," and that, as part of the study, they would be asked to input into a computer program their skin cancer–related medical and family history, sun-exposure behaviors, attitudes, and skin tone. After participants input this information, the computer program provided them with a risk diagnosis (which comprised the risk induction), followed by either high- or low-efficacy information (described subsequently). After receiving the risk diagnosis and efficacy information, participants were asked to fill out a battery of questions that measured study outcomes. At this point, participants were provided with a number of Web sites on skin cancer, and they were asked to view the sites and provide the experimenters with their feedback. The Web sites were edited versions of information provided by the Centers for Disease Control and Prevention, National Cancer Institute, and the Cancer Research Foundation of America. Once participants finished reviewing the Web sites, they clicked on the link that indicated they were done.

Subsequently, participants were asked to complete a paper and pencil–based questionnaire that tested their knowledge about skin cancer. Questions were derived from information presented to participants in the various Web sites.

Table 1 Risk Perception Attitude Framework Clusters and Expected Contrast Coefficients for Study 1 (in parentheses)

Efficacy Beliefs	Perceived Risk	
	High	Low
High	Responsive (2)	Proactive (1)
Low	Avoidance (−1)	Indifference (−2)

Participants were then debriefed, at which point they were informed that the risk and efficacy inductions were administered at random, and they were made to understand that the risk diagnosis provided by the computer had nothing to do with their actual risk. Questions that participants raised at this point of the study were then answered. Care was taken to ensure that participants fully understood that the risk and efficacy inductions were administered at random, and that the risk score they received was not based on any of the medical and family history that they provided. After ensuring that participants fully understood the nature of the experimental inductions, they were asked not to share the actual purpose of the experiment with other students, thanked, and then dismissed.

Risk induction

After participants provided their skin cancer–related information, they saw a screen that displayed a thermometer-like diagram. In the *high-risk condition*, 90% of the thermometer tube was filled with a bright red color, and below it, participants were informed that their risk was "within the top 10% of the population." They were also told

> This means that you are highly vulnerable to skin cancer. This assessment was made by calculating various factors, including your age, sex, race, family history, your reported behaviors, your attitudes, and other factors. While this assessment is not 100% accurate, it is highly reliable. As you know, skin cancer can be a deadly disease. Effects of skin cancer can range anywhere from mild inconvenience to something much more dangerous and fatal.

In the *low-risk condition*, participants saw the same diagram, but this time only 10% of the thermometer was filled with the bright red color, and they were informed that their risk was "within the bottom 10% of the population."

Other information provided to the participants was the same as that in the high-risk condition. Thus, the risk induction included both susceptibility and severity components.

Efficacy induction

After receiving the risk induction, participants read either a high-efficacy or a low-efficacy message. In the high- (or low-) efficacy condition, participants were told that there was "quite a bit" (in the low-risk condition: "very little") they could do to prevent skin cancer; that wearing sunscreen and protective clothing were "highly effective" ("Band-Aid") solutions; that "doing something about prevention is totally up to you" ("by the time we are 18 or 19, our fate is already determined"); that taking precautionary measures "dramatically reduces your chances of getting skin cancer" ("makes us feel good, but they're no good for actual prevention"); and that "skin cancer will remain a threat only if you ignore the issue" ("until we ban most of the chemicals that we're exposed to everyday, skin cancer will remain a threat for most people"). Thus, the efficacy induction included both self-efficacy and response efficacy.

Measures

All scales reported here, measured on 7-point scales unless otherwise noted, have been validated elsewhere (Rimal & Real, 2003). Confirmatory factor analysis procedures were conducted on each scale that included four or more items (Hunter & Gerbing, 1982). These scales were determined to be internally consistent, with minimal errors.

Behavioral intention. After the experimental inductions, participants were asked 17 questions pertaining to their intention to (a) avoid sunlight as much as possible (four questions, one for each season), (b) wear sunscreen (four questions), (c) wear protective clothing (four questions), (d) wear a hat (four questions), and (e) examine body for moles or other unusual growths (one question). Responses to all 17 questions were standardized and averaged into an index (α = .81).

Intention to seek information. Six questions were asked after the experimental inductions to determine the extent to which participants intended to seek information about skin cancer. Three questions were specific to media: "If you saw a skin cancer story on television (newspapers, or the Internet) how much attention would you pay to it?" Three other questions referred to interpersonal discussion about skin cancer with friends, family members, and physicians. Responses to all six questions were standardized and averaged into an index (α = .86).

Information seeking. After they answered the postinduction questions, participants were provided access to six Web sites on skin cancer. Unbeknownst to them, we kept track of the amount of time they spent reviewing the Web sites. Time spent by participants ranged from 35 s to 14 min (one participant spent more than 1 hr; because of the unusual response, this participant was dropped from subsequent analyses). This variable was segmented into 1-minute intervals. At the end of the experiment, participants were also asked how many Web sites they had visited (maximum = 6). These two measures—amount of time spent viewing Web sites and the number of Web sites visited—constituted two separate measures of information seeking.

Knowledge-acquisition rates. Participants were asked 30 questions about skin cancer. Some of these questions were in a multiple-choice format and others were in a true/false format. In designing the questions, we attempted to include only material that was discussed on the Web sites so that prior knowledge would not be tested, although this proved to be a difficult task, as much of the Web content included information about skin cancer that is widely known among college students. Each correct answer was awarded one point. To increase reliability, we iteratively dropped items until reliability was maximized, which resulted in the inclusion of 19 items (α = .67). In order to control for prior knowledge and to determine learning as a function of time spent on the Web sites, we calculated the knowledge-acquisition rate as the ratio of the total knowledge score to the amount of time spent. Hence, knowledge-acquisition rate represents knowledge gained per minute spent on the Web sites.

Risk and efficacy inductions. After the induction, participants were asked three questions to measure their susceptibility: (a) their risk to skin cancer compared to most people their age, (b) their likelihood of getting skin cancer, and (c) the amount of risk they felt about getting skin cancer. Three other questions measured their perceived severity: how much they agreed that skin cancer (a) was a deadly disease, (b) could kill, and (c) was more deadly than most people realized. Responses to these six questions were averaged into an index of perceived risk ($\alpha = .84$).

Three questions were asked to measure self-efficacy: the extent to which participants felt confident that they could (a) protect themselves against skin cancer, (b) wear sunscreen each time they go out in the sun for more than 15 min, and (c) wear protective clothing when they were out in the sun for more than 15 min. For each self-efficacy question, an analogous question about response efficacy (for example, belief that wearing sunscreen would prevent skin cancer) was also asked. Responses to the six questions were averaged into an index of efficacy beliefs ($\alpha = .79$).

Statistical analyses

Hypotheses were tested through analysis of variance (ANOVA) with each information-seeking outcome as the dependent variable.[1] In order to test our hypothesis, clusters were formed on the basis of participants' perceptions of risk and efficacy, and these clusters are submitted to a one-way ANOVA with the specified contrasts employed.

Power analysis

In other studies examining risk and efficacy (Witte, 1994), effect sizes ranged from medium to very large, with an average effect size of $d = .77$ for attitudes and $d = .80$ for behaviors. Setting alpha and beta at their conventional standards of .01 and .80, respectively, approximately 36 subjects per cell are needed for attitudes and 33 subjects are needed per cell for behaviors to detect significant differences between groups (Cohen, 1988, p. 28).

Results

Induction checks

An ANOVA revealed that those assigned to the high-risk condition ($n = 66$, $M = 4.62$, $SD = .77$) perceived greater risk than those assigned to the low-risk condition ($n = 61$, $M = 3.64$, $SD = .71$), $F(1, 122) = 55.27$, $p < .001$, $\eta^2 = .31$. Those assigned to the high-efficacy condition ($n = 62$, $M = 3.59$, $SD = .69$) perceived greater efficacy than those assigned to the low-efficacy condition ($n = 65$, $M = 2.78$, $SD = .69$), $F(1, 122) = 44.49$, $\eta^2 = .27$. Crossover effects were not significant in that those in the high- and low-risk conditions did not differ in their efficacy beliefs, $F(1, 122) = .03$, $p > .05$, $\eta^2 = .00$, and those in the high- and low-efficacy conditions did not differ in their risk perceptions, $F(1, 122) = .06$, $p > .05$, $\eta^2 = .00$. Importantly, controlling for prerisk and preefficacy did not change this model, likely due to participants being randomly assigned to conditions.

Formulation of the RPA groups

In order to determine the RPA group membership, we conducted a four-group cluster analysis from the postinduction risk and efficacy scores. Cluster analysis is a data analysis tool for solving classification problems. In this case, its object is to sort people into groups, or clusters, so that the degree of association is strong between members of the same cluster and weak between members of different clusters. Each cluster thus describes, in terms of the data collected, the class to which its members belong; this description may be abstracted through use from the particular to the general class or type. The four-group solution converged in six iterations, yielding four clusters corresponding to the four RPA groups, and both risk perception, $F(3, 125) = 96.69$, $p < .001$, and efficacy beliefs, $F(3, 125) = 114.08$, $p < .001$, were significantly associated with the cluster classification. It is notable that when comparing the four clusters (clustered on the basis of the induction checks) to the four experimentally induced groups, these data indicate few errors, $\chi^2(3, N = 127) = 56.69$, $p < .001$. That is, the cluster analysis converged with the experimental inductions providing further evidence of the effectiveness of the inductions. In fact, as an additional test, we formulated the four RPA groups through median splits of post-induction risk and efficacy scores and then compared these four groups with groups obtained through the cluster analysis. These two classification techniques were highly correlated, $\chi^2(3, N = 129) = 301.97$, $p < .001$, and 89.9% of the cases were classified into the same group by both methods. Hence, the four clusters, signifying the indifference, proactive, avoidance, and responsive groups, comprised the four levels of our independent variable.

Effects on behavioral intention

We predicted that the four RPA groups would differ from each other on each dependent variable, with the highest scores being obtained by the responsive group and the lowest scores being obtained by those in the indifference group (see Table 1 for contrast coefficients). First, we examined behavioral intentions as a function of the RPA clusters. This analysis indicated that there was a substantial effect for the predicted contrast model $F(1, 125) = 58.61$, $p < .001$, $\eta^2 = .31$ (see Table 2 for means and standard deviations). In addition, there was a trivial amount of residual variation $F(2, 125) < 1.00$, *ns*; hence, this analysis indicates that the data are consistent with predictions.

Effects on intention to seek information

The second test of our prediction was conducted with intention to seek information about skin cancer as the dependent variable. Again, there was a substantial effect for the predicted model, $F(1, 125) = 32.36$, $p < .001$, $\eta^2 = .17$, with a trivial amount of residual variation, $F(2, 125) < 1.00$, *ns*; hence, this analysis indicates that the data are consistent with the prediction. It should be noted, however, that one unexpected finding was that the indifference and the proactive groups were only marginally different ($p = .09$).

Table 2 Skin Cancer–Related Outcomes of the Four Groups in the Risk Perception Attitude Framework (Study 1)[a]

Health Outcomes	Indifference (n = 23) M (SD)	Proactive (n = 41) M (SD)	Avoidance (n = 29) M (SD)	Responsive (n = 36) M (SD)
Behavioral intention[b]	$-.75_{c}$ (.62)	$.00_{b}$ (.42)	$-.07_{b}$ (.71)	$.68_{a}$ (.78)
Information seeking intention[b]	$-.65_{d}$ (.60)	$-.25_{c}$ (.70)	$.16_{b}$ (.51)	$.68_{a}$ (.79)
Information seeking				
No. of Web sites visited[c]	5.22_{a} (1.38)	5.15_{a} (1.67)	5.28_{a} (1.47)	5.30_{a} (1.24)
Time spent on the Web[d]	4.32_{b} (2.33)	5.67_{b} (3.26)	7.49_{a} (3.48)	5.87_{ab} (3.40)
Knowledge-acquisition rate[e]	$-.40_{c}$ (.70)	$-.21_{bc}$ (.75)	$.04_{ab}$ (.32)	$.09_{a}$ (.27)

[a]Cell entries are means compared across the four groups. Entries sharing the same subscripts are not different at $p < .05$.
[b]Behavioral intention to take preventative action against skin cancer and information-seeking intentions represent the composite of standardized scores (and hence some entries are negative numbers).
[c]Range 1–6.
[d]Measured in 1-minute increments.
[e]Ratio of total knowledge across 19 items to total time spent seeking information. Because total knowledge was the sum of standardized scores, some entries are negative.

Effects on information seeking

Information seeking was operationalized in two ways: the number of Web sites visited and the amount of time spent visiting Web sites (Pearson r between these two measures = .61, $p < .0001$).

Number of Web sites visited

The contrast model was not significant $F(1, 123) = .001$, *ns*. Moreover, this was not simply the effect of the contrasts predicting an incorrect model because the omnibus test was also not significant, $F(3, 123) = .08$, $p > .05$, $\eta^2 = .00$, indicating that the four groups did not differ in the number of Web sites on skin cancer that they visited during the experiment. Hence, the hypothesis was not consistent with the data for this outcome.

Time spent seeking information

The predicted contrast model did not fit these data $F(1, 125) = .44$, *ns*. Thus, these data are not represented by the predicted contrast coefficients. Nonetheless, the data do indicate that time spent by participants visiting skin cancer Web sites differed across the four groups, $F(3, 125) = 4.85$, $p < .05$, $\eta^2 = .15$. The proactive group spent marginally more time on the Web than the indifference group, and the avoidance group spent marginally more time on the Web than the responsive group (see Table 1). Most of the differences occurred between the indifference group ($M = 4.32$ min, $SD = 2.33$) and the avoidance group ($M = 7.49$, $SD = 3.48$; $t = 3.85$, $p < .01$), but this was not hypothesized. These data suggest that when efficacy beliefs were low, increasing people's risk perceptions resulted in greater information-seeking behaviors. The most surprising of these findings is that the avoidance group spent the most time seeking information.

Effects on knowledge-acquisition rates

Knowledge gained per unit time spent on the Web sites was predicted well by the contrast model $F(1, 125) = 4.82$, $p < .05$, $\eta^2 = .03$. However, further examination of the data indicated that the omnibus ANOVA accounted for more variance than the contrast model $F(3, 125) = 4.53$, $p < .01$, $\eta^2 = .10$, revealing that the means of the clusters do not differ in quite the predicted manner (see Table 2). The proactive and indifference groups did not differ from each other, and the responsive and avoidance groups did not differ from each other. The knowledge-acquisition rate was lowest among the indifference group, as compared to the other three groups, and the knowledge-acquisition rate was greater among the responsive group as compared to the proactive group. Interestingly, the avoidance group spent the most time seeking information but did not score better on the knowledge measure. These data replicate the odd finding in Rimal and Real (2003). Hence, it is likely that the finding is not an anomaly.

Discussion

The primary purpose of Study 1 was to determine whether efficacy beliefs moderate the relationship between risk perception and information seeking. Results from this study revealed that efficacy beliefs do moderate this relationship but not always in the predicted direction. For each level of risk perception, those with higher, compared to lower, efficacy beliefs were more likely to engage in information-seeking behaviors. The proactive group scored higher on both outcomes than the indifference group, as did the responsive group in comparison to the avoidance group. Most interesting, however, was the finding that the higher level of time spent by the avoidance group in seeking information about skin cancer on the Web. The RPA framework predicts that members of this group would avoid information, but we did not find this to be the case. Furthermore, despite having spent a great deal of time on the Web, the avoidance group was not able to retain a corresponding amount of information. Given that this finding replicates what Rimal and Real (2003) reported, we are unable to dismiss it as happenstance. Rather, we offer two possible explanations in the form of testable hypotheses: the *incredulity hypothesis* and the *anxiety-reduction* hypothesis.

According to the incredulity hypothesis, participants in the avoidance group likely did not believe the high-risk status attributed to them because they already knew their true risk and therefore were not "fooled" by the induction. They likely resolved to disconfirm their purported high-risk status by engaging in risk-ameliorating behaviors. This explanation seems plausible, given most college students (the participants in the study) already have high prior knowledge about skin cancer and risk factors associated with skin cancer. It is possible the increased information-seeking behavior induced by the message (that they were at high risk) can be attributed to participants' unwillingness to believe the risk induction. This would also explain why the avoidance group, despite seeking more information, was not able to retain what was learned. Members likely used the health information not to gain knowledge but rather to disconfirm what they had been told.

Another plausible explanation is that the high-risk groups experienced a great deal of anxiety upon being told that their risk to skin cancer was high. This would be particularly germane to members of the avoidance group because they were told that their risk was high and ability to combat the threat was low. In order to reduce the anxiety, the avoidance group was likely motivated to seek more information. However, the avoidance group's ability to retain knowledge was also impeded due to cognitive overload. We label this phenomenon affective interference, whereby a heightened level of affect (in this case, anxiety) impedes systematic processing of information.

This explanation is theoretically sound given the detrimental impact that anxiety has on information processing. In fact, the negative impact that anxiety exerts is demonstrated in recall tasks (Hodges & Spielberger, 1969; Miller, Mueller, Goldstein, & Potter, 1978), anagram solving (Deffenbacher, 1978), inferential reasoning (Darke, 1988), mathematical problem solving (Hamilton, 1975), and message elaboration (Sengupta & Johar, 2001). Importantly, lower levels of persuasive message elaboration are obtained under high anxiety (vs. low anxiety) conditions, when the message is nonanxiety related. On the other hand, when the message is anxiety related, Sengupta and Johar found that individuals had increased motivation to process.

Thus, it might be that the combination of high-risk and low-efficacy causes increases in felt anxiety. And, when a message induces high anxiety, individuals have increased motivation to process, but they lack ability to elaborate on the messages they encounter. Therefore, although people in this condition seek information, they cannot retain it. The Elaboration Likelihood Model (Petty & Cacioppo, 1986) posits that motivation is caused by outcome involvement. It is likely that increased perceptions of susceptibility and severity (i.e., risk) induce individuals to feel involved. This involvement leads to the motivation to process information (or in EPPM language, engage in danger control). Nonetheless, because individuals in the avoidance group lack ability to process information (anxiety decreases ability), participants will still reveal a lack of systematic processing—which decreases their ability to learn the information they sought. It should be noted that the anxiety hypothesis is in direct contradiction to the EPPM (Witte, 1992), which argues that when individuals experience high risk and low efficacy, they are likely to experience defensive motivations and fear control.

Study 2

Both explanations—the incredulity hypothesis and the anxiety-reduction hypothesis—lead to similar predictions: The avoidance group will seek more but be able to retain less information. Study 2 was designed to test whether the anxiety-reduction hypothesis is more plausible than the incredulity hypothesis. It is based on the premise that if participants have little prior knowledge about a disease or about their risk status, when confronted with a risk assessment, they are less likely to react with incredulity. Hence, we chose a disease, diabetes, about which participants, college students, were likely to possess little prior knowledge. To the extent that we replicate findings from Study 1 (in which the avoidance group sought more but retained less information), we can rule out the incredulity hypothesis and place more confidence in the anxiety-reduction hypothesis. If the underlying process is driven by risk-induced anxiety, then prior knowledge about the disease should have little bearing on participants' experience of anxiety. If, however, we do not replicate our previous findings, and find instead that the avoidance group, as predicted by the RPA framework, sought and retained less information, then we can rule out the anxiety-reduction hypothesis and conclude that the superior outcomes associated with the avoidance group were due to the incredulity surrounding the risk and efficacy inductions.

Hypotheses

H2: Members of the avoidance group will experience significantly greater amounts of anxiety than the indifferent and the proactive groups.

We note that those in the responsive group are also likely to experience anxiety (given their high-risk perceptions), but this anxiety will likely be alleviated because of the high-efficacy perceptions. Hence, the contrast coefficients depicting this prediction are avoidance group (2), indifference group (-1), proactive group (-1), and responsive group (0).

H3: Members of the avoidance group will seek more information than all other RPA groups. Hypothesis 3 is tested with the following contrast coefficients: avoidant group (3), indifferent group (-1), proactive group (-1), and responsive group (-1).

H4: Members of the avoidant group will score lower on retention measures than the other RPA groups when taking into account (a) the amount of time spent seeking and (b) their prior knowledge. Hypothesis 4 is tested with the following contrast coefficients: avoidants (-3), indifferents (1), proactives (1), and responsives (1).

Although Hypotheses 3 and 4 center on information seeking and retention, we also measured intentions to seek and intentions to engage in protective behaviors in an attempt to replicate findings from Study 1.

The specific health issue we investigate in Study 2 is diabetes. Diabetes was chosen primarily because we anticipated that few college students (our study population) would know much about it, which would allow us to rule out the incredulity hypothesis as a likely explanation about why the avoidance group sought more but was able to retain less information. Diabetes is also a serious disease. Although over 15 million people in the United States have diabetes, and it is the seventh leading cause of death, it is not widely understood by the general population, and one third of diabetics are unaware that they have the disease (American Diabetes Association, 2002).

Method

Using identical procedures as those used in Study 1, a 2 (perceived risk: high or low) $\times$ 2 (efficacy beliefs: high or low) between-subjects experiment was conducted. In summary, participants provided information about their height, weight, diet, behaviors, and family medical history with regard to diabetes. Participants were then told that, based on this information, the computer algorithm would calculate their risk for diabetes. At this point, participants were randomly assigned to one of four conditions: indifference (low risk, low efficacy), proactive (low risk, high efficacy), avoidance (high risk, low efficacy), or responsive (high risk, high efficacy). Participants were then asked questions to measure their motivations and behaviors, after which they were provided access to various Web sites dealing with diabetes. After they visited the Web sites, we measured their knowledge acquisition and we kept track of the amount of time they spent on the Web. Finally, participants were thoroughly debriefed about the experiment, their risk-related questions and concerns were addressed, and they were dismissed.

Measures

Where possible, variables were modeled after those used in Study 1. Again, confirmatory factor analysis procedures were conducted on each of the scales (where appropriate) to test for internal consistency. These items yielded nonegregious errors and were kept in the analyses.

Behavioral intentions

Six questions were asked to measure the extent to which participants intended to engage in diabetes-prevention behaviors. These questions corresponded with the six behavioral actions recommended in the induction, and they included engaging in 20 min of vigorous physical activity 5 days a week, engaging in 20 min of moderate physical activity 5 days a week, eating fruits and vegetables, reducing the intake of or not eating fatty foods, getting a blood test at least once a year, and drinking lots of fluids every day. Responses, all measured on 7-point Likert scales, were standardized and averaged into an index ($\alpha = .87$).

Intention to seek information

After the inductions, four questions asked participants how likely they would be to pay attention to stories about diabetes if they encountered such stories on television, in newspapers, on the Internet, and in magazines. Five questions asked how likely they would be to talk about diabetes with their friends, family members, doctors, nurses, and other people in general. Responses, all measured on a 7-point Likert scales, were standardized and averaged into an index ($\alpha = .90$).

Information seeking

Total amount of time participants spent reviewing information about diabetes was used as a measure of information seeking. Participants were also asked to indicate how many Web sites (between 0 and 9) they visited, and this was used as a second measure of information seeking.

Knowledge

Before the inductions, 10 diabetes-related questions were asked of all participants. These questions pertained to symptoms of the disease, recommended preventive actions, physiological effects of the disease, and so forth. Responses were of either multiple-choice or true-false format. One point was assigned for each correct response, and a total was calculated for each participant ($\alpha = .40$). The low reliability of this index suggests that answers were more random than systematic, which is also indicated by the low average score, 4.02 (SD = 1.81) out of a total of 10.

At the end of the study, after participants indicated that they had finished reviewing the Web sites, they were given a battery of 20 questions that tested them on Web site content. Ten of these questions were the same ones used to test prior knowledge, but the other 10 were new questions. Of the 10 new questions, we discarded 3 because of low reliability. One point was assigned for each correct response, and a total was calculated for each participant (maximum = 17; α = .75), average = 8.77 (SD = 3.63). The internal consistency for the 10 items used to measure prior knowledge, when asked after the inductions, was α = .69, indicating that one of the effects of the inductions was to create greater homogeneity in responses.

Rate of knowledge acquisition

We conceptualized rate of knowledge acquisition as knowledge gained per unit time reviewing information about diabetes. This was calculated as the ratio of the post-induction knowledge to time spent (in minutes) reviewing information about diabetes on the Web sites. Hence, this variable represents the rate of knowledge gained per unit time spent reviewing information about diabetes.

Anxiety

At the end of the online questionnaire, eight questions were asked to measure anxiety. Participants indicated, on a 7-point Likert scale, the extent to which they were worried, anxious, nervous, terrified, panicked, scared, fearful, and frightened (α = .94).

Risk and efficacy inductions

After the inductions, two questions measured severity of the threat ("Diabetes is a serious disease that can kill" and "If untreated, diabetes can be fatal") and two questions measured perceived susceptibility ("Compared to most people my age, I understand that my risk of getting diabetes is …" and "The amount of risk that I feel about getting diabetes is …"). Because the inductions included both susceptibility and severity, we did not make a distinction between these two indicators of perceived risk in calculating the strength of the inductions. Responses to all four items, measured on 7-point Likert scales, were averaged into an index (α = .67) of perceived risk. A similar set of four questions was asked before the induction (averaged into an index, α = .56) to gauge participants' prior risk.

After the inductions, participants were asked three questions to measure their self-efficacy, defined as confidence in ability to take preventive action. Three questions were asked to measure response efficacy, defined as the belief that taking preventive action would be effective. Because the efficacy induction varied self-efficacy and response efficacy, we did not make distinctions between these two variables in calculating the strength of the efficacy induction. Responses to the six items, all scored on 7-point Likert scales, were averaged into an index (α = .78). Responses to a similar set of questions asked before the induction were averaged into an index (α = .57) of prior efficacy. Preinduction efficacy scores were used as covariates.

Results

Induction checks

An ANOVA revealed that those assigned to the high-risk condition (n = 88, M = 5.40, SD = 1.06) perceived greater risk than those assigned to the low-risk condition (n = 88, M = 3.08, SD = 1.07), $F(1, 170) = 209.97$, $p < .001$, $\eta^2 = .55$. Those assigned to the high-efficacy condition (n = 87, M = 5.41, SD = .89) perceived greater efficacy than those assigned to the low-efficacy condition (n = 89, M = 4.56, SD = .91), $F(1, 171) = 39.39$, $\eta^2 = .19$. Crossover effects were not significant in that those in the high- and low-risk conditions did not differ in their efficacy beliefs, $F(1, 171) = .23$, $p > .05$, $\eta^2 = .00$, and those in the high- and low-efficacy conditions did not differ in their risk perceptions, $F(1, 170) = .74$, $p > .05$, $\eta^2 = .00$. Thus, the inductions were successful.

Formulation of the RPA groups

As in Study 1, a four-group cluster analysis was performed with the postmanipulation risk and efficacy scores. The four-group solution converged in seven iterations, yielding four clusters corresponding to the four RPA groups, and both risk perception, $F(3, 172) = 163.64$, $p < .001$, and efficacy beliefs, $F(3, 172) = 118.49$, $p < .001$, were significantly associated with the cluster classification. The four groups obtained through the cluster analysis were compared with those formulated on the basis of assignment to experimental conditions, $\chi^2(3, N = 176) = 60.23$, $p < .001$, and this analysis revealed few errors. Hence, the four clusters were used as the four RPA groups.

Justification for the use of diabetes

As noted previously, at pretest, individuals' perceived knowledge was only 40%. Given that the number of answer choices for each question ranged from two (true/false) to six (multiple choice), we calculated the average random score to be 3.82 out of 10. That is, if participants were to respond to all questions at random, they would be expected to score 3.82 percent points by chance. Our average score, 4.02%, did not differ significantly from this expected score (t = 1.48, $p > .1$). Thus, the primary assumption on which this study rests in order to rule out the incredulity hypothesis—that participants' prior knowledge about the disease was low—appeared sound.

Hypothesis 2

H2 predicted that the avoidance group would score higher on anxiety than the indifference and proactive groups. This analysis indicated a substantial effect for the predicted contrast model $F(1, 172) = 24.92$, $p < .001$, $\eta^2 = .12$, and that there was a trivial amount of residual explained variation, $F(2, 172) < 1.00$, *ns*. H2 is consistent with these data.

Hypothesis 3

H3 predicted that behavioral intentions, intention to seek information, and actual information seeking would be greater in the avoidance group than in all other RPA groups. The first test of these hypotheses was conducted with behavioral intention as the dependent variable in the predicted contrast model. The contrast model did not explain the variance in the data $F(1, 172) = .08$, *ns*. However, there were differences in the means, though not in the expected direction. The omnibus test was significant, $F(3, 172) = 28.43$, $p < .001$, $\eta^2 = .33$. The avoidance group expressed greater behavioral intentions than both low-risk groups; yet, the avoidant group and the responsive group did not differ (see Table 3).

The second test used intention to seek information as the dependent variable in an ANOVA model. The contrast model was significant, $F(1, 172) = 16.00$, $p < .001$, $\eta^2 = .07$, with little residual explained variation $F(2, 125) < 1.00$, *ns*.

Next, we examined the number of Web sites visited as a function of the contrast model. The contrast model was not significant, $F(1, 167) = 1.78$, *ns*. Finally, the amount of time participants spent reviewing skin cancer–related Web sites was analyzed. The predicted model was only marginally significant $F(1, 172) = 2.97$, $p = .08$, $\eta^2 = .01$. Hence, these data only partially support Hypothesis 3.

Hypothesis 4

H4 predicted that the rate of knowledge acquisition would be lower in the avoidance group, in comparison to the responsive group. The contrast model did not explain these data well $F(1, 166) = 1.49$, *ns*. However, the omnibus analysis of covariance (ANCOVA) (controlling for prior knowledge as predicted) test was significant, $F(4, 171) = 5.77$, $p < .001$, $\eta^2 = .12$. The knowledge-acquisition rate of the avoidance group ($M = 1.78$, $SD = .99$) was lower ($t = 2.06$, $p < .05$) than that of the responsive group, and hence H4 was partially supported. The means reveal that those in the avoidance group retained less information than those in both the responsive and proactive groups, even though they sought the same amount of information. Means for all the groups are shown in Table 3.

Discussion

Findings from Study 2 indicated not only that the risk induction generated anxiety but also that this anxiety, contrary to our predictions, was not tempered by efficacy beliefs. Those in the high-risk (avoidance and responsive) groups experienced more anxiety than those in the low-risk (indifference and proactive) groups, and the two high-risk groups did not differ from each other in anxiety. We should note that the level of anxiety experienced by our participants was rather low; even among the

Table 3 Diabetes-Related Outcomes of the Four Groups in the Risk Perception Attitude Framework (Study 2)[a]

Health Outcomes	Indifference (n = 42) M (SD)	Proactive (n = 54) M (SD)	Avoidance (n = 43) M (SD)	Responsive (n = 37) M (SD)
Anxiety	1.94_b (1.09)	1.62_b (.85)	2.89_a (1.44)	2.87_a (1.44)
Behavioral intention[b]	$-.73_c$ (.76)	$.18_b$ (.70)	$.03_b$ (.64)	$.55_a$ (.39)
Information-seeking intention[c]	2.64_b (1.07)	2.79_b (1.05)	3.99_a (1.27)	3.94_a (1.53)
Information seeking				
No. of Web sites visited[d]	7.05_a (2.93)	6.96_a (2.22)	7.57_a (2.20)	6.89_a (2.50)
Time spent on the Web[e]	5.05_a (3.48)	6.19_a (3.54)	6.51_a (3.86)	5.05_a (3.36)
Knowledge-acquisition rate[f]	1.63_b (1.01)	1.99_{ab} (1.08)	1.78_b (.99)	2.34_a (1.41)

[a]Cell entries are means compared across the four groups. Entries sharing the same subscripts are not different at $p < .05$.
[b]Measured as the composite of standardized scores (and hence some entries are negative).
[c]Range 1–7.
[d]Range 1–9.
[e]Measured in 1-minute increments.
[f]Ratio of total knowledge to total time spent seeking information.

avoidance group, for example, the mean score was 2.89 ($SD = 1.44$) on a 7-point scale. Our battery of questions that measured anxiety was asked toward the end of the study, approximately 20–30 min after the risk and efficacy inductions were administered and after participants had answered numerous other questions. This may have allowed enough time for feelings of anxiety to dissipate, which could explain the low levels of anxiety we observed across the sample. Nevertheless, the two high-risk groups, compared to the two low-risk groups, experienced significantly greater levels of anxiety.

Based on our results, it appears that the risk-induced anxiety increases information-seeking motivations. We found, for example, that patterns of anxiety across the four RPA groups were similar to those observed for information-seeking intentions—the two high-risk groups scored higher than the two low-risk groups on both measures. Further analyses revealed that the zero-order correlation between anxiety and information-seeking intention was moderately strong: $r = .50$, $p < .001$. Analyses also showed that the correlation between anxiety and actual information seeking was not significant, $r = .05$, $p > .05$. Furthermore, these two correlations were significantly different from each other, thus signifying that the effect of anxiety was to propel people to *resolve* to seek information.[2] The correlation between intention to seek information and actual information seeking (as measured by amount of time spent on the Web sites), however, was $r = .18$, $p < .05$. It thus appears that when people receive a high-risk diagnosis for a deadly disease, the risk-induced anxiety evokes *resolutions* to seek information. Intentions to seek information leads to greater information seeking.

Being told that they were at high risk and that there was little they could do to prevent the disease, avoidance group members experienced anxiety. It thus appears that members of the avoidance group sought to reduce their anxiety by resolving to seek information and enact self-protective behaviors.

These data also showed that, despite greater information-seeking intentions, the avoidance group did not differ from the other three groups in information-seeking behaviors. The four groups were found not to differ in the number of Web sites they visited and in the amount of time they spent seeking information. What we did find, however, was that members of the avoidance group, despite having expended roughly the same amount of effort in seeking information as members of the responsive group, were not as able to assimilate the information they encountered. We attribute this to avoidance group members' anxiety, which served as an impediment to learning. Thus, anxiety had a dual function. On the one hand, it propelled information-seeking behaviors; on the other hand, it interfered with learning.

In order to test this phenomenon in a post hoc manner, we ran regression equations that predicted knowledge from membership in the avoidance group (dummy variable), time spent on the Web, and anxiety. As shown in the second column in Table 4, there was a significant three-way interaction effect between membership in the avoidance group, information seeking, and anxiety on knowledge. This signifies that the joint effect of anxiety and information seeking on

Table 4 Anxiety and Information Seeking as Predictors of Knowledge From Post Hoc Regression Equations (Study 2)[a]

Predictors	Entire Sample (N = 176)	Avoidance Group (n = 43)	Indifference, Proactive, and Responsive Groups (n = 133)
Avoidance group (AG)[b]	.04	—	—
Information seeking (IS)[c]	.44***	.46**	.43***
Anxiety[c]	.01	.05	−.01
IS × Anxiety	.06	−.34*	.06
AG × IS × Anxiety	−.21*	—	—
Total R^2	.191***	.216*	.178***

[a]Cell entries are standardized betas from regression equations with all variables included in the model.
[b]Coded as avoidance group member = 1 and others = 0.
[c]Time spent seeking information on the Web and anxiety were centered around their mean to reduce multicollinearity.
* $p < .05$. ** $p < .01$. *** $p < .001$.

knowledge varied according to membership in the avoidance group. This is shown in the next two columns in Table 4, where regressions were conducted for only the avoidance group (third column), and all others (fourth column). Of particular interest are the two beta coefficients pertaining to the joint influence of information seeking and anxiety. For the avoidance group, this coefficient was negative ($\beta = -.34$, $p < .05$), whereas it was not statistically significant ($\beta = .06$, $p > .05$) for the other three groups. In other words, for the avoidance group, the joint effect of heightened anxiety and information seeking was suppression of knowledge acquisition; for the others, no such relationship was found.

General discussion

Prior studies based on the RPA framework have shown that, in a natural context (Rimal, 2002; Rimal & Real, 2003, Study 2), the indifference group (characterized by low perceived risk and low-efficacy beliefs) was associated with the least healthy outcomes, the responsive group (high risk, high efficacy) was associated with the most healthy outcomes, and the proactive (low risk, high efficacy) and avoidance (high risk, low efficacy) groups were associated with intermediate-level outcomes. In the experiment-based context, however, when risk and efficacy was induced (Rimal & Real, Study 1), the avoidance group displayed more information seeking than expected. In this study, prior findings are not only replicated, but the hypothesis that the avoidance group's outcomes were driven by participants' need to reduce anxiety was tested.

Findings from these studies indicate that risk-induced anxiety can have both positive and negative outcomes. Whereas anxiety motivates individuals to undertake self-protective behaviors, such as information seeking, it also impedes systematic information processing. We suspect that anxiety-induced information seeking did not result in concomitant levels of learning in this study because the nature of the information that we provided did not match the kinds of information that individuals were seeking. What we provided was mainly factual information about the disease, such as prevention techniques, symptoms, management of the disease, and so forth. It might be that highly anxious people were seeking information that would help them cope with the disease, manage their nervousness, and calm their nerves. It thus appears that the avoidance group needs information that will enhance their coping efficacy. If so, a future study could investigate this proposition more directly by pursuing the hypothesis that people in the avoidance group will learn less from cognitively oriented information (e.g., facts, rational appeals) than from affect-oriented information.

Limitations

Perhaps the primary limitation of this study pertains to issues surrounding external validity. In both experiments, participants were assigned risk scores through an impersonal means by having the computer make the diagnosis. Even though induction checks revealed that participants' self-reported risk and efficacy scores were consistent with the inductions, it is possible that students provided assessments they thought they were supposed to provide. After all, it would have been more convenient to assert that one's risk was minimal if one had just been told that it was minimal. What raises our confidence that perhaps social desirability was not a major problem in the experiments, however, is our observation that the high-risk groups experienced more anxiety than the low-risk groups. If social desirability was the primary motivation for participants' assessments, it is unlikely that we would have found systematic differences in anxiety.

Another limitation of this study pertains to our assumption that intentions to seek information should immediately translate into information-seeking behaviors. That we did not find differences across the four groups in information seeking could simply mean that participants resolved to seek (and actually would have sought) information at a later time, at their own convenience. In fact, if the avoidance group did experience more anxiety that interfered with their information-processing abilities, it is likely that their risk-induced intentions would have translated into actual behaviors once they were able to manage their negative affect. A more robust test would have queried the participants at a later date to determine whether they had engaged in information-seeking behaviors. We were unable to do so, however, because of our ethical obligation to debrief participants immediately after the experiment.

Implications

Scholars have argued (see Witte, 1992, 1994) that when risk perceptions exceed efficacy beliefs, fear control processes will take place. In essence, when persons have more risk than they do efficacy, individuals will engage in defensive avoidance, thereby ignoring relevant information. But these data indicate a different process altogether. These data reveal that those in the avoidance group do not avoid information. In fact, future RPA studies should relabel the avoidance group as the anxious group. Findings from this study lead us to hypothesize, instead, that the anxious group seek anxiety-reducing information. This has theoretical and practical implications. From a theoretical perspective, it suggests the hypothesis that, at times of heightened risk, people will show preference for, or gravitate toward, affectively based information. Thus, in a future study, if the Web sites provided to participants were varied according to their affect-oriented information (e.g., a highly soothing information base vs. a highly rational information base), we could hypothesize that anxiety would be positively correlated with preferences for the affect-oriented information base.

It is also possible that the avoidance group was motivated to seek efficacy-enhancing information rather than risk-reducing information. Being told that their risk was high, avoidance group members could have sought information that would help them manage their high risk. Given the design of our study, we are not able to test the hypothesis that the avoidance group will gravitate toward efficacy-enhancing messages more than toward risk-reducing messages. This, however, seems like a worthy question to explore in a future study as findings from such a study are likely to have important consequences for message design.

The practical implication of this paper pertains to many situations in which physicians face the task of informing their patients that they are at high risk to a deadly disease. Results from our experiment suggest that, in such a scenario, it is imperative to impart efficacy-building information. At a minimum, individuals' anxieties should be addressed. In the absence of this provision, it is likely that further information delivered by the physician (after informing the patient that his or her risk is high) may not be processed or remembered, patients' desires to obtain information notwithstanding. This situation can potentially lead to adverse consequences because it is quite likely that important risk-reducing information, one that usually follows a high-risk diagnosis, will be lost on patients. In such situations, perhaps a better strategy would be to provide emotional counseling first and then ask patients to return at a later date (at which time risk-reducing information can be imparted to patients). Alternatively, physicians may consider providing the risk-reducing information on paper so that patients can read it after they have first reduced their anxiety.

Notes

1 We also conducted ANCOVAs with the prerisk and preefficacy variables as covariates. Neither pretest variable emerged as a significant covariate. We do not, therefore, report the results of the ANCOVA analyses.

2 Significance of the differences in correlations was calculated by first transforming the raw correlations into corresponding *z*-scores (Z_1 and Z_2) and then computing the critical statistic, Z_c, which has a normal distribution, and is given by the formula

$$Z_c = \frac{Z_1 - Z_2}{\sqrt{\frac{1}{n_1 - 3} + \frac{1}{n_2 - 3}}},$$

where n_1 and n_2 are the sample sizes corresponding to the two correlations. In our example, $Z_c = 4.64$, $p < .001$.

References

American Diabetes Association (2002). All About Diabetes. Retrieved February 28, 2004, from http://diabetes.org/about-diabetes.jsp.

Babrow, A. S. (2001). Uncertainty, value, communication, and problematic integration. *Journal of Communication*, **51**, 553–573.

Bandura, A. (1977). *Social learning theory*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist*, **37**, 122–147.

Bandura, A. (1983). Self-efficacy determinants of anticipated fears and calamities. *Journal of Personality and Social Psychology*, **45**, 464–469.

Bandura, A. (1986). *Social foundations of thought and action*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1995). Exercise of personal and collective efficacy in changing societies. In A. Bandura (Ed.), *Self-efficacy in changing societies* (pp. 1–45). New York: Cambridge University Press.

Bandura, A. (1999). A social cognitive theory of personality. In L. Pervin & O. John (Eds.), *Handbook of personality* (2nd. ed., pp. 154–196). New York: Guilford.

Bandura, A., Pastorelli, C., Barbaranelli, C., & Caprara, G. V. (1999). Self-efficacy pathways to childhood depression. *Journal of Personality and Social Psychology*, **76**, 258–269.

Brashers, D. E., Goldsmith, D. J., & Hsieh, E. (2002). Information seeking and avoiding in health contexts. *Human Communication Research*, **28**, 258–271.

Brashers, D. E., Neidig, J. L., Haas, S. M., Dobbs, L. K., Cardillo, L. W., & Russel, J. A. (2000). Communication in the management of uncertainty: The case of persons living with HIV or AIDS. *Communication Monographs*, **67**, 63–84.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Darke, S. (1988). Effects of anxiety on inferential reasoning task performance. *Journal of Personality and Social Psychology*, **55**, 499–505.

Deffenbacher, J. L. (1978). Worry, emotionality, and task-generated interference in test anxiety: An empirical test of attentional theory. *Journal of Educational Psychology*, **70**, 248–254.

Dolinski, D., Gromski, W., & Zawisza, E. (1987). Unrealistic pessimism. *Journal of Social Psychology*, **127**, 511–516.

Dutta-Bergman, M. J. (2005). Developing a profile of consumer intention to seek out additional information beyond a doctor: The role of communicative and motivation variables. *Health Communication*, **17**, 1–16.

Glynn, S. M., & Ruderman, A. J. (1986). The development and validation of an eating self-efficacy scale. *Cognitive Therapy and Research*, **10**, 403–420.

Hamilton, V. (1975). Socialization anxiety and information processing: A capacity model of anxiety-induced performance deficits. In I. G. Sarason & C. D. Spielberger (Eds.), *Stress and anxiety* (pp. 45–68). Washington, D.C.: Hemisphere.

Hays, R. D., & Ellickson, P. L. (1990). How generalizable are adolescents' beliefs about pro-drug pressures and resistance self-efficacy. *Journal of Applied Social Psychology*, **20**, 321–340.

Hodges, W. F., & Spielberger, C. D. (1969). Digit span: An indicant of trait or state anxiety? *Journal of Consulting and Clinical Psychology*, **33**, 430–434.

Hunter, J., & Gerbing, D. (1982). Unidimensional measurement, second order factor analysis, and causal models. *Research in Organizational Behavior*, **4**, 267–320.

Jemmott, J. B., III, Jemmott, L. S., Spears, H., Hewitt, N., & Cruz-Collins, M. (1991). Self-efficacy, hedonistic expectancies, and condom-use intentions among inner-city Black adolescent women: A social cognitive approach to AIDS risk behavior. *Journal of Adolescent Health*, **13**, 512–519.

Joseph, J. G., Montgomery, S. B., Emmons, C. A., Kirscht, J. P., Kessler, R. C., Ostrow, D. G. et al. (1987). Perceived risk of AIDS: Assessing the behavioral and psychosocial consequences in a cohort of gay men. *Journal of Applied Social Psychology*, **17**, 231–250.

Larwood, L. (1978). Swine flu: A field study of self-serving bias. *Journal of Applied Social Psychology*, **8**, 283–289.

Lawrance, L., & Rubinson, L. (1986). Self-efficacy as a predictor of smoking behavior in young adolescents. *Addictive Behaviors*, **11**, 367–382.

Maibach, E., & Murphy, D. A. (1995). Self-efficacy in health promotion research and practice: Conceptualization and measurement. *Health Education Research*, **10**, 37–50.

Miller, D. J., Mueller, J. H., Goldstein, A. J., & Potter, T. L. (1978). Depth of processing and test anxiety in landscape recognition. *Bulletin of Psychological Society*, **11**, 341–343.

Ozer, E. M., & Bandura, A. (1990). Mechanisms governing empowerment effects: A self-efficacy analysis. *Journal of Personality and Social Psychology*, **58**, 472–486.

Petty, R. E., & Cacioppo, J. T. (1986). Communication and persuasion: Central and peripheral routes to attitude change. New York, NY: Springer Verlag.

Rimal, R. N. (2000). Closing the knowledge-behavior gap in health promotion: The mediating role of self-efficacy. *Health Communication*, **12**, 219–237.

Rimal, R. N. (2001). Longitudinal influences of knowledge and self-efficacy on exercise behavior: Tests of a mutual reinforcement model. *Journal of Health Psychology*, **6**, 31–46.

Rimal, R. N. (2002). Perceived risk and self-efficacy as motivators: Understanding individuals' long-term use of health information. *Journal of Communication*, **51**, 633–654.

Rimal, R. N., Flora, J. A., & Schooler, C. (1999). Achieving improvements in overall health orientation: Effects of campaign exposure, information seeking, and health media use. *Communication Research*, **26**, 322–348.

Rimal, R. N. & Real, K. (2003). Perceived risk and efficacy beliefs as motivators of change. *Human Communication Research*, **29**, 370–400.

Robertson, L. S. (1977). Car crashes: Perceived vulnerability and willingness to pay for crash protection. *Journal of Community Health*, **3**, 136–141.

Rogers, R. W., & Prentice-Dunn, S. (1997). Protection motivation theory. In D. S. Gochman (Ed.), *Handbook of health behavior research: Personal and social determinants* (pp. 113–132). New York: Plenum.

Sengupta, J., & Johar, G. V. (2001). Contingent effects of anxiety on message elaboration and persuasion. *Personality and Social Psychology Bulletin*, **27**, 139–150.

Svenson, O., Fischhoff, B., & MacGregor, D. (1985). Perceived driving safety and seatbelt usage. *Accident Analysis and Prevention*, **17**, 119–133.

van der Velde, F. W., Hooijkaas, C., & van der Pligt, J. (1991). Risk perception and behavior: Pessimism, realism, and optimism about AIDS-related health behavior. *Psychology and Health*, **6**, 23–38.

Viswanath, K., & Finnegan, J. R., Jr. (1996). The knowledge gap hypothesis: Twenty-five years later. In B. Burleson (Ed.), *Communication Yearbook* (Vol. 19, pp. 187–227). Thousand Oaks, CA: Sage.

Weinstein, N. D. (1982). Unrealistic optimism about susceptibility to health problems. *Journal of Behavioral Medicine*, **5**, 441–460.

Weinstein, N. D. (1983). Reducing unrealistic optimism about illness susceptibility. *Health Psychology*, **2**, 11–20.

Weinstein, N. D., Grubb, P. D., & Vautier, J. (1986). Increasing automobile seatbelt use: An intervention emphasizing risk susceptibility. *Journal of Applied Psychology*, **71**, 285–290.

Weinstein, N. D., Sandman, P. M., & Roberts, N. E. (1990). Determinants of self-protective behavior: Home radon testing. *Journal of Applied Social Psychology*, **20**, 783–801.

Winkleby, M. A., Flora, J. A., & Kraemer, H. C. (1994). A community-based heart disease intervention: Predictors of change. *American Journal of Public Health*, **84**, 767–772.

Witte, K. (1992). Putting the fear back into fear appeals: The Extended Parallel Process Model. *Communication Monographs*, **59**, 3230–349.

Witte, K. (1994). Fear control and danger control: A test of the Extended Parallel Process Model (EPPM). *Communication Monographs*, **61**, 113–134.

Witte, K., & Allen, M. (2000). A meta-analysis of fear appeals: Implications for effective public health campaigns. *Health and Education Behavior*, **27**, 591–615.

Zillman, D., & Bryant, J. (Eds.). (1985). *Selective exposure to communication*. Hillsdale, NJ: Lawrence Erlbaum Associates.