

The processing of fear-arousing communications: How biased processing leads to persuasion

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Two experiments were conducted to examine the processing of fear-arousing communications, and tested predictions derived from the stage model of processing of fear-arousing communications. The studies focused on the impact of manipulations of vulnerability to and severity of a health risk on the processing of both the fear appeal and the subsequent action recommendation, and assessed how message processing relates to attitudes, intentions, and behavior. Results confirmed predictions that vulnerability to a severe health risk induces defense motivation, which is reflected in a negative processing bias in threat appraisal and a positive processing bias in coping appraisal, which in combination promotes persuasion. The theoretical and practical implications of these findings are discussed.

Keywords: Fear appeals; Vulnerability; Defense motivation; Biased processing.

Fear-arousing communications are widely used in health education campaigns. It is assumed that the more one succeeds in making individuals concerned about the consequences of their health-impairing behavior, the greater will be the probability that they accept the recommended action. This notion has been confirmed in several meta-analyses on fear appeals which have shown that high fear messages induce more attitude, intention, and behavior change than low fear messages (Boster & Mongeau, 1984; De Hoog, Stroebe, & de Wit, 2007; Witte & Allen, 2000). In spite of this evidence, the use of fear appeals remains controversial, mainly because of the emphasis on the possible aversive effects. This discrepancy between empirical evidence and theoretical and popular notions is partly due to the fact that research on fear appeals has

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not yet succeeded in fully elucidating the cognitive and motivational processes that mediate the persuasive impact of fear appeals.

To contribute to an understanding of the mechanisms underlying the effects of fear appeals, the present experiments were designed to further test predictions from our stage model of processing of fear-arousing communications (Das, de Wit, & Stroebe, 2003; De Hoog, Stroebe, & de Wit, 2005) by assessing how motivational concerns derived from fear appeals influence individuals' information processing of such communications. In two experiments we assessed two important aspects of the workings of fear-arousing communications. First, we illustrated the impact of manipulations of vulnerability to and severity of a health risk on the processing of both the fear appeal and the subsequent action recommendation. Second, we established how this message processing affects attitudes, intention, and behavior.

THEORETICAL PERSPECTIVES IN THE STUDY OF FEAR-AROUSING COMMUNICATIONS

Research on the impact of fear-arousing communications can be divided into three distinct phases. The first phase began with the classic study of Janis and Feshbach (1953) and was theoretically guided by the drive-reduction model of fear appeals (Hovland, Janis, & Kelley, 1953). According to this model, when individuals are presented with threatening information they will be motivated to search for responses that reduce the threat. When a response reduces fear, it is reinforced and becomes part of one's permanent response repertory. The drive model therefore suggests that higher fear should result in more persuasion, but only if the recommended action is perceived as effective in averting danger.

Because part of the empirical evidence was inconsistent with the drive model, Leventhal (1970) proposed a parallel response model, which introduced threat appraisal as the important mediator between environmental threat and action, and abandoned the notion that emotional arousal is a necessary antecedent of the adaptation to danger. The introduction of this model was the beginning of the second, more cognitive phase of research on fear-arousing communications. According to the parallel response model, a threat is cognitively evaluated by the individual, and this appraisal can give rise to two parallel or independent processes, namely danger control and fear control. Danger control involves the decision to act as well as instrumental actions to reduce or eliminate the threat. Actions in the service of fear control, such as avoidance actions as well as attempts to control emotional responses (e.g., drinking alcohol), frequently have no effect on the actual danger.

A limitation of the parallel response model is that it does not specify the processes of cognitive appraisal that precede action tendencies. This task

was completed by later models that focused mostly on elaborating Leventhal's danger control process, including protection motivation theory (Rogers, 1983). More recently, Witte's extended parallel process model (1992) re-emphasized the role of fear by elaborating conditions under which fear control is likely to affect danger control. According to the extended parallel process model, perceived efficacy of the recommended action will determine whether individuals who believe that they are susceptible to a serious threat will engage in danger or fear control. Individuals mainly engage in danger control when they perceive the recommended action as effective in reducing the threat, and they mainly engage in fear control when they perceive the recommendation as ineffective or when they feel unable to perform the recommended action.

The one assumption shared by all Phase 1 and Phase 2 models is that the level of threat interacts with the perceived efficacy of a recommended action in their impact on attitude, intention, and behavior. These models suggest that even the most vulnerable individuals will not adopt protective actions that they perceive as ineffective in averting negative consequences or feel unable to execute. However, there is no clear empirical evidence for such threat by efficacy interactions (see De Hoog et al., 2007; Witte & Allen, 2000). Furthermore, the models developed in Phase 1 and 2 assumed that cognitive processes mediate persuasion, but they made no predictions about information processing. Moreover, measures of information processing (e.g., cognitive responses) have been virtually absent in research on fear appeals.

This situation changed in Phase 3, with the advent of dual-process theories of attitude change (Chaiken, 1980; Petty & Cacioppo, 1986) that were soon applied to account for the impact of fear-arousing communications on persuasion (e.g., Gleicher & Petty, 1992; Liberman & Chaiken, 1992). Dual-process theories focus on the processing of the arguments contained in a communication as well as on the outcomes of persuasion. According to dual-process theories fear arousal can have two effects: they can act as a motivator to induce recipients to engage in intensive message processing, and they can induce defense motivation that leads to biased message processing.

Whereas the unbiased or accuracy-motivated perceiver assesses the validity of information in the interest of achieving a valid position, the processing goal of defense-motivated recipients is to confirm the validity of a preferred position and disconfirm the validity of non-preferred positions. Notably, defense-motivated individuals will process information in ways that best support their own beliefs. This implies that information that is congruent with a particular preferred position will be judged as more valid than information that is incongruent with this position (Ditto & Lopez, 1992; Lord, Ross, & Lepper, 1979; Pyszczynski & Greenberg, 1987). The

main contribution of the dual-process approach to fear appeals is to our understanding of how threatening information in fear appeals is processed and how information processing affects relevant attitudes and behaviors (e.g., Liberman & Chaiken, 1992; Reed & Aspinwall, 1998; Sherman, Nelson, & Steele, 2000).

THE STAGE MODEL OF PROCESSING OF FEAR-AROUSING COMMUNICATIONS

The stage model of processing of fear-arousing communications (Das et al., 2003; De Hoog et al., 2005; Stroebe, 2000) integrates and extends ideas from dual-process theories (e.g., Chaiken, 1980) and cognitive theories of fear-arousing communications (Leventhal, 1970; Rogers, 1983; Witte, 1992). In combining information-processing concepts with general appraisal assumptions of fear appeal models, the stage model attempts to explain the underlying cognitive processes that make fear-arousing communications effective.

In line with most Phase 2 theories, the stage model assumes that individuals who are exposed to fear-arousing communications engage in two types of appraisal, namely appraisal of the threat, and appraisal of coping strategies available for reducing or eliminating the threat. These two appraisal processes parallel the two components of fear-arousing communications: the fear appeal, which emphasizes the severity of and vulnerability to a risk, and the action recommendation, which provides information on how to avoid the risk. The stages in the stage model match the two components of fear-arousing communications that are usually encountered in a temporal sequence, and have to be processed one by one. However, these message components are generally presented in close proximity, and the stage model does not rule out that threat and coping appraisals influence each other. Following stress-coping theories, it is seen as a recursive process of reappraisal in which coping appraisal can affect threat appraisal (e.g., Lazarus & Folkman, 1984). Furthermore, a central tenet of the stage model is that threat appraisal not only influences the activation of coping appraisal, but also its outcome, as elaborated below.

Building on assumptions of dual-process theories of attitude change (e.g., Chaiken, 1980), the stage model predicts the impact of the perceived severity of the health threat and of the vulnerability of the recipients on their processing motivation and processing mode (see Figure 1). When a health risk is trivial and individuals do not feel vulnerable, they are unlikely to invest much effort in thinking about the contents of the communication, and they will rely on heuristic processing modes. When individuals do feel vulnerable to a minor risk, feelings of vulnerability should induce motivation to systematically process the communication. This is in line

		Severity of threat	
		Low	High
Vulnerability	Low	Heuristic processing Accuracy motivation	Systematic processing Accuracy motivation
	High	Systematic processing Accuracy motivation	Systematic processing Defense motivation

Figure 1. The impact of vulnerability and severity on processing mode and goal.

with the assumption of dual-process theories that personal relevance, a concept similar to perceived vulnerability, is a key motivator of systematic processing (e.g., Eagly & Chaiken, 1993).

When individuals do not feel vulnerable, but a risk is depicted as severe, they are also assumed to invest effort in processing the content of a communication. This may seem to differ from dual-process theories, which hold that personal relevance (i.e., vulnerability) is an important precondition for systematic processing (e.g., Eagly & Chaiken, 1993). However, in most dual process research on personal relevance low personal relevance means that the topic is really irrelevant for the recipient. In contrast, health risks are hardly ever totally irrelevant.¹ Even when one does not feel vulnerable to a specific health threat at a given point time, this could change over time, and it might therefore be useful to be well informed about a serious risk, even if the danger is not imminent (e.g., recall the bird flu epidemic that resulted in many news items and probably induced a great deal of information processing even in non-affected regions of the world). In other words, the stage model proposes that severity of a risk can also operate as a motivational factor that increases the likelihood of systematic processing.

The core of the stage model revolves around the situation when individuals feel vulnerable to a severe health risk. This situation should seriously threaten people's self-definitional beliefs of being healthy, and consequently arouse defense motivation. It is further assumed that message processing under defense motivation will be systematic and not heuristic, because any communication describing a serious personal threat is likely to require a thorough and critical evaluation (Chaiken, Liberman, & Eagly,

¹ Unless of course you think of health risks that cannot possibly affect someone, for example women and prostate cancer. However, this is an irrelevant condition as health communications would never target people who cannot be affected by a certain health risk.

1989). Defense motivation induced by the perception of a threat as severe should manifest itself not only in avoidance reactions as previous fear appeal models have proposed (e.g., Witte, 1992), but also in systematic processing that is biased. The direction of the bias aroused by defense motivation depends on the type of appraisal.

In appraising the fear appeal (Stage 1), defense-motivated individuals will attempt to minimize the threat by critically looking at the content of a fear appeal. They will scrutinize the message to find ways to criticize and downplay the information in order to reduce the threat. As research has shown, defense-motivated individuals engage, for instance, in a biased search for inconsistencies, and evaluate the evidence with a bias in the direction of their preferred conclusion (Ditto & Lopez, 1992; Liberman & Chaiken, 1992; Sherman et al., 2000). However, the stage model further proposes that threat-minimizing strategies often will not be successful in derogating the fear appeal, because even biased processing is constrained by evidence and rules of inference (Kunda, 1987). In such situations individuals will have to (implicitly) accept that they are personally at risk, and the stage model proposes that then the subsequent processing of the action recommendation will be biased as well. This bias, however, is assumed to be in a positive direction.

In appraising the action recommendation (Stage 2), the processing goal of defense-motivated individuals will be to make the protective action appear effective, because this would enable them to feel safe. Biased processing of the action recommendation will involve attempts to make the recommendation appear highly effective. Thus, individuals might engage in a biased search for arguments that support the effectiveness of the recommended action, or try to generate positive thoughts about the recommendation. In other words, defense motivation will lead to a *positive* bias in the processing of the action recommendation, and consequently will heighten the motivation to engage in a protective action, regardless of the quality of the arguments supporting this protective action.²

The stage model makes a clear distinction between evaluative and action related persuasive outcomes. Whereas other fear appeal theories assume that fear appeals have the same impact on attitudes as on intentions and behavior, the stage model makes differential predictions for attitudes on the one hand and intention and behavior on the other. Attitudes about a

² There are two limiting conditions to this maximizing strategy. First, like all biased processes it is constrained by evidence and rules of inference (Kunda, 1987). Thus, if the claims made in the action recommendation are blatantly implausible, the individual might reject the recommended action as an effective response to the threat (i.e., low response efficacy). Second, if individuals feel unable to perform the recommended action (i.e., low self-efficacy) they might also reject the action recommendation.

protective action are seen purely as an evaluation of the provided information. Individuals will therefore base their attitudes towards a protective action on the facts described in the communication, like the quality of the recommendation. This is in contrast to intentions and behavior, which have behavioral implications, and are therefore dominated by perceived vulnerability. Individuals will only be motivated to engage in a protective action if they feel vulnerable to the health threat. After all, why should one invest effort into avoiding a health threat, if one does not feel personally at risk?

EMPIRICAL EVIDENCE

Indirect support for the stage model can be found in some studies that assessed the impact of vulnerability and severity on the processing of fear appeals (Stage 1). These studies mainly showed that people are more critical of evidence that is highly health threatening, than of less threatening evidence (Ditto & Lopez, 1992; Kunda, 1987; Liberman & Chaiken, 1992; Reed & Aspinwall, 1998; Sherman et al., 2000). Few studies have focused on the processing of action recommendations (Stage 2), and these studies either failed to manipulate vulnerability experimentally (Jepson & Chaiken, 1990) or failed to include measures of cognitive processing (Gleicher & Petty, 1992). More importantly, none of these studies explained how processing of a fear appeal relates to processing of the action recommendation, and how defense motivation can have a positive effect on persuasion.

Direct support for some of the predictions of the stage model, particularly those referring to the positive processing bias of the action recommendation, have been shown in our previous studies (Das et al., 2003; De Hoog et al., 2005). These studies assessed the effects of vulnerability to and severity of a health risk on the processing and acceptance of an action recommendation, which was supported by high or low quality arguments. It was found that vulnerable respondents in the high severity condition reported more positive thoughts about the recommendation, than did respondents in all other conditions. Furthermore, vulnerability was the only determinant of individuals' intention to engage in the recommended action, and this effect was mediated by negative affect about the fear appeal and positive thoughts about the action recommendation. Findings were less consistent for attitudes. In particular, impact of argument quality on attitudes varied across experiments, thus weakening the case for systematic processing. A further shortcoming of these studies is that they only focused on the processing of an action recommendation, and thus only tested half of the stage model.

The present studies contribute to the previous studies in several important ways: We examine the processing of a fear appeal, whereas our previous

studies only focused on the processing of action recommendations. We also explore the relation between processing of the fear appeal and the action recommendation, determining how processing of both parts of fear-arousing communications affect each other and lead to persuasion. In addition, we test our depth of processing assumptions further with a source credibility manipulation in the first experiment. Furthermore, we provide extra tests of our defense motivation assumptions, by looking specifically at the high vulnerability and high severity condition and comparing this to the other three conditions. Lastly, the present studies use a new experimental paradigm, thus extending the generalization of our findings.

Two experiments will be reported which manipulated vulnerability to and severity of a health risk. Experiment 1 assessed the impact of vulnerability and severity only on the processing of a fear appeal. Experiment 2 studied the impact of these variables on both the processing of a fear appeal and the processing of an action recommendation, and examined the relation between both processes and how they relate to persuasion.

EXPERIMENT 1

This experiment assessed processing of a fear appeal, and no action recommendation was offered. The topic of the study was the negative health consequences of hypoglycemia (i.e., low blood glucose levels).³ Respondents' vulnerability to hypoglycemia was manipulated, after which they read a message depicting the health consequences of hypoglycemia as either high or low in severity. Furthermore, we also manipulated the credibility of the source to which the severity information was attributed.

We predicted that exposure to a message depicting negative health consequences of hypoglycemia would arouse negative affect, and expected that the high severity message should arouse more negative affect than the low severity message. In addition, we predicted that vulnerable respondents would experience more negative affect than non-vulnerable respondents. When respondents feel vulnerable and the consequences of the health risk are depicted as severe, this should generate the most negative affect, more so than in all the other conditions.

With regard to respondents' cognitive responses we expected a fear appeal to generate several types of thoughts (e.g., about vulnerability or the severity of the consequences), and we were particularly interested in thoughts that

³ Hypoglycemia is a common but unfamiliar condition that literally means low blood glucose levels. Blood glucose levels express the amount of sugar in the blood. Blood glucose levels are supposed to stay within certain levels; when the level goes under the lowest normal level one speaks of hypoglycemia. As a consequence of low blood glucose levels, a number of systems in the body can no longer function properly and the body constantly fights to retain a balance. This can result in a large number of physical and psychological consequences.

revealed attempts to minimize the threat, which would indicate a negative processing bias. We predicted that the high severity condition should generate more minimizing cognitive responses than the low severity condition. Moreover, vulnerable respondents should have more minimizing thoughts than non-vulnerable respondents. Because our stage model predicts that defense motivation should be aroused especially when respondents feel vulnerable *and* when the consequences of the health risk are depicted as severe, respondents in the condition of high vulnerability and severity should have more minimizing thoughts than respondents in the other three conditions.

To provide an explicit test of our depth of processing expectations, we manipulated the credibility of the source to which the severity information was attributed. When the likelihood of thoughtful processing is low, source credibility can operate as a heuristic cue and should therefore affect the persuasive impact of a message mainly during heuristic processing (i.e., when both vulnerability and severity are low).

Even though in this experiment no action recommendation was offered, we did ask respondents about their attitude and intention toward getting medically tested for hypoglycemia. In accordance with the prediction of the stage model that attitudes reflect an evaluation of the provided information, and are not influenced by feelings of vulnerability, we did not expect to find any effect on attitudes. In contrast, intentions are proposed to be determined mainly by feelings of vulnerability, and therefore we predicted a main effect of vulnerability: Only individuals who feel vulnerable should want to change their behavior.

Method

Participants and design

Respondents were 127 (38 male, 89 female) students at Utrecht University, who participated for payment of €3. Four respondents who expressed suspicion of the vulnerability manipulation were not included in the analysis, therefore the analyses were based on data from 123 (36 male, 87 female) respondents. Respondents were run individually and were randomly assigned in equal numbers to the conditions of a 2 (vulnerability) \times 2 (severity) \times 2 (source credibility) between-participants factorial design.

Independent variables

Vulnerability. Respondents were randomly given false feedback after completing “Doctor Harper’s health test for hypoglycemia”, a genuine 55-item questionnaire used to indicate problems with blood glucose levels. Half the respondents were told that they were very vulnerable to hypoglycemia (“Very vulnerable: The probability of you becoming hypoglycemic is very

high”) and the other half were told that they were not very vulnerable to hypoglycemia (“Not very vulnerable: The probability of you becoming hypoglycemic is very low”).

Severity. Respondents read a 350-word message, which described the health consequences of hypoglycemia in detail. It described the impact of low blood glucose levels on several processes in the body and in the brain as well as numerous physical and psychological negative consequences. The severity of these consequences was depicted as either high (e.g., convulsions, organ failure, and depression) or low (e.g., headaches, mood swings, fatigue). These two messages were rated high and low in severity, respectively, in a pilot study.

Source credibility. Source credibility was manipulated by attributing the severity message to either a scientific magazine (high credibility) or a popular women’s magazine (low credibility).

Procedure

The experiment was conducted on personal computers in our laboratory. After a brief introduction, in which respondents were told they were participating in a study on health and were introduced to the concept of hypoglycemia, respondents received a communication that manipulated their vulnerability to the health risk. They were told there was a test that could measure vulnerability to hypoglycemia. Respondents were asked to fill out this questionnaire and then received bogus feedback on their computer screens. Half the respondents were told their score on the test indicated that they were very vulnerable to hypoglycemia and the other half were told their score meant that they were not very vulnerable to hypoglycemia.

Next, a message about the health consequences of hypoglycemia was presented. This message depicted the health consequences of hypoglycemia as either high or low in severity. This message was attributed to a source either high or a low in credibility. After this message, respondents were queried about their affect and cognitions regarding the severity message, and the effectiveness of the manipulations was checked. Even though in this experiment no action recommendation was offered, we did ask respondents about their attitude and intentions toward getting medically tested for hypoglycemia. Before leaving, respondents were thoroughly debriefed.

Manipulation checks

Vulnerability was assessed by having respondents rate their vulnerability on three items with 7-point rating scales: how vulnerable respondents perceived

themselves to be, 1=not vulnerable; 7=very vulnerable; how high they thought their risk for becoming hypoglycemic was, 1=very low; 7=very high; and the subjective probability of experiencing negative health consequences due to hypoglycemia, 1=very low; 7=very high ($\alpha=.94$).

Severity was also assessed by three items, namely how severe, harmful, and serious respondents perceived the described health consequences of hypoglycemia, with 7-point rating scales ranging from 1 (not at all) to 7 (very) ($\alpha=.85$).

Source credibility was assessed by four items with 7-point rating scales ranging from 1 (not at all) to 7 (very): "How credible did you find the message?", "How reliable do you think the information in the message is?", "How much of an expert do you think the author of the message is?", and "How accomplished do you think the author of the message is?" ($\alpha=.82$).

Dependent variables

Negative affect. Negative affect was measured with six semantic differential items with 7-point rating scales (not fearful–fearful, calm–restless, comfortable–uncomfortable, good–bad, relaxed–tense, and optimistic–pessimistic; $\alpha=.91$).

Cognitive responses. To measure cognitive processing of the severity message, respondents were asked to write down all their thoughts concerning the severity message. Separate boxes were provided for each thought (five boxes in total) and respondents were requested to type each thought into a separate box.

Measures of persuasion. Attitude towards being tested for hypoglycemia was measured by having respondents indicate on four semantic differential items with 7-point rating scales how useful, good, important, and effective they found being tested for hypoglycemia ($\alpha=.92$). Intention to be tested for hypoglycemia was measured by three items with 7-point rating scales ranging from 1 (certainly not) to 7 (certainly): Do you have the intention to, do you want to, and are you going to get tested for hypoglycemia? ($\alpha=.94$).

Results

Preliminary analyses showed that there were no gender effects on any of the dependent variables. Therefore three-way analyses of variance (ANOVAs) that included vulnerability, severity, and source credibility manipulations as factors were performed for all dependent measures, unless stated otherwise.

In addition, planned contrasts were performed to test whether the condition of high vulnerability and high severity differed significantly from all other conditions on negative affect and cognitive responses.⁴

Manipulation checks

Vulnerability. The check of the manipulation of vulnerability revealed a main effect of vulnerability, $F(1, 115)=38.80, p<.001, \eta^2=.25$. Respondents perceived their vulnerability as higher in the high vulnerability condition ($M=4.06$) than in the low vulnerability condition ($M=2.51$). No other effects were found (all $F_s<1$).

Severity. The manipulation of severity was also effective. Respondents who received the message with high severity consequences of hypoglycemia perceived these consequences as more severe ($M=5.45$) than did those respondents who received the message with low severity consequences ($M=4.13$), $F(1, 115)=70.57, p<.001, \eta^2=.38$. No other effects were found (all $F_s<2.1$).

Source credibility. There was a main effect of source condition, $F(1, 115)=28.11, p<.001, \eta^2=.20$. The source high in credibility was perceived as more credible ($M=4.85$) than the source low in credibility ($M=4.09$). No other effects were found (all $F_s<1.7$).

Dependent variables

Negative affect. Main effects of both vulnerability, $F(1, 115)=7.48, p<.01 (\eta^2=.06)$, and severity, $F(1, 115)=6.20, p<.05, \eta^2=.05$, were found. As expected, vulnerable respondents experienced more negative affect ($M=4.03$) than did non-vulnerable respondents ($M=3.46$), and the message high in severity elicited more negative affect ($M=4.00$) than the message low in severity ($M=3.49$). No other effects were found (all $F_s<1$: see Table 1). Planned contrasts, contrasting the high vulnerability/high severity condition with the three other conditions, showed as predicted that vulnerable respondents in the high severity condition experienced

⁴ Because we did not predict regular vulnerability \times severity interactions, but ordinal interactions, with the high severity/high vulnerability condition expected to differ from the other three conditions, the best way to test these predictions is to do contrast analyses, contrasting the high severity/high vulnerability condition against the other three conditions. When testing whether one cell differs from three other cells, significant interaction effects are not a necessary precondition.

TABLE 1
Means (*SDs*) of negative affect by vulnerability and severity

	<i>Low severity</i>	<i>High severity</i>
<i>Experiment 1</i>		
Low vulnerability	3.27 (1.28)	3.65 (1.03)
High vulnerability	3.70 (1.09)	4.36 (1.14)
<i>Experiment 2</i>		
Low vulnerability	2.91 (1.06)	3.21 (.93)
High vulnerability	3.79 (1.12)	4.32 (1.07)

more negative affect than did all other respondents, $F(1, 119)=11.73$, $p<.01$.⁵

Cognitive responses. Two independent raters attributed respondents' thoughts about the severity message into several categories, including minimizing thoughts (range: 0–2; Kappa=.85).⁶ Examples of minimizing thoughts are: “I do not think the consequences of hypoglycemia are as bad as they described” and “I am not becoming hypoglycemic, I am just having a very stressful week”. Minimizing thoughts were divided by total number of thoughts, which resulted in a minimizing thought ratio (range: 0–1). Respondents reported an average of 2.08 ($SD=.68$) thoughts in total (range: 1–4). A three-factor ANOVA on total number of thoughts about the severity message did not result in any significant effects.

As predicted, main effects of both severity, $F(1, 119)=20.19$, $p<.001$, $\eta^2=.15$, and vulnerability, $F(1, 119)=30.80$, $p<.001$, $\eta^2=.21$, were found on the minimizing thoughts ratio (Table 2). Respondents had a higher proportion of minimizing thoughts when the consequences were high in severity ($M=.39$) than when severity was low ($M=.15$). Moreover, vulnerable respondents had relatively more minimizing thoughts ($M=.42$) than non-vulnerable respondents did ($M=.13$). No other effects were found (all $F_s<1.9$). Planned contrasts, contrasting the high vulnerability/high severity condition with the three other conditions, confirmed that vulnerable

⁵ For all contrast analyses in this paper we also conducted additional contrasts, contrasting the high vulnerability/high severity condition against the other three conditions separately, which resulted in similar effects.

⁶ The other thought categories included: severity of the health consequences, threat not relevant to self, familiarity with the health consequences, and thoughts not related to the experiment. Only very few respondents had thoughts in the last two categories, therefore no analyses were performed on these variables. Analyses of variance on thoughts about the severity of the health consequences did not result in any significant effects, all $F_s<1$. The ANOVA of thoughts not being relevant to self resulted in a main effect of vulnerability, $F(1, 119)=21.15$, $p<.001$. Non-vulnerable respondents more often thought the information was not relevant to them than did vulnerable respondents.

TABLE 2
 Mean ratios (*SDs*) of minimizing thoughts about the fear appeal by vulnerability and severity

	<i>Low vulnerability</i>	<i>High vulnerability</i>
<i>Experiment 1</i>		
Low severity	.04 (.13)	.26 (.31)
High severity	.21 (.31)	.58 (.35)
<i>Experiment 2</i>		
Low severity	.04 (.12)	.22 (.36)
High severity	.14 (.27)	.49 (.43)

respondents under high severity had relatively more minimizing thoughts than respondents in all other conditions, $F(1, 119)=43.52, p<.001$.

Attitude. No effects were found, as expected (all $F_s<2.4$). Respondents were generally positive about being medically tested for hypoglycemia ($M=5.21$; see Table 3).

Intention. There was only a main effect of vulnerability, $F(1, 115)=12.76, p<.01, \eta^2=.10$. As expected, vulnerable respondents had a higher intention to be medically tested ($M=3.81$) than did non-vulnerable respondents ($M=2.97$; Table 3). For all other effects, $F<1.1$.

TABLE 3
 Means (*SDs*) of attitude and intention by vulnerability, severity, and source credibility (Experiment 1)

	<i>Low vulnerability</i>	<i>High vulnerability</i>
<i>Attitude</i>		
Low severity		
Low source credibility	5.45 (.89)	4.94 (1.13)
High source credibility	5.23 (.72)	5.37 (.53)
High severity		
Low source credibility	4.80 (1.08)	5.27 (.79)
High source credibility	5.30 (.77)	5.40 (.75)
<i>Intention</i>		
Low severity		
Low source credibility	2.49 (1.17)	3.65 (.91)
High source credibility	3.33 (1.66)	4.00 (1.10)
High severity		
Low source credibility	2.85 (1.41)	3.84 (1.37)
High source credibility	3.18 (1.48)	3.76 (1.26)

Discussion

The results of this study confirmed our prediction that vulnerability to a severe health risk induces defense motivation, which is evident in a negative bias in processing of the fear appeal. Vulnerable respondents in the high severity condition reported relatively more minimizing thoughts than did non-vulnerable respondents in the same condition and all respondents in the low severity conditions.

Negative affect aroused by the fear appeal was dependent on both vulnerability and severity. Vulnerable respondents experienced more negative affect than non-vulnerable respondents, and the high severity information elicited more negative affect than did the low severity information. Vulnerable respondents who received a high severity message also experienced more negative affect than any other respondents did.

There was little support for our prediction that recipients of information about a health risk that is not severe, and to which they do not feel vulnerable, process this information less systematically than other respondents. Our source credibility manipulation failed to have a significant effect on any dependent variable in this experiment, despite a significant manipulation check indicating that respondents did differentially perceive the credibility of the source. One explanation might be that the low credible source was still perceived as credible enough to not affect message processing and persuasion. Alternatively, even in the low severity condition the perceived severity of the health risk was above the midpoint of the scale. This indicates that even in the low severity condition the health risk was not perceived as trivial, which would be a precondition for heuristic processing according to our stage model. In sum, it appears as though in all conditions systematic processing took place.

In this study, in which no action recommendation was provided, no effects on attitude towards being tested for hypoglycemia were found. Respondents generally had positive attitudes towards being medically tested for hypoglycemia. Moreover, as predicted, vulnerability had no effect on attitudes, showing that feelings of vulnerability did not influence respondents' evaluations of being medically tested for hypoglycemia. However, vulnerable respondents did have a higher intention to be medically tested for hypoglycemia than did non-vulnerable respondents. This supports our prediction that vulnerability determines intention, and presumably action.

EXPERIMENT 2

In the previous experiment only a fear appeal was presented and no detailed action recommendation was offered. This gave us the opportunity to examine the processing of the fear appeal in detail. To test our full model a second experiment was conducted, which generally used procedures

identical to Experiment 1 with the difference that an action recommendation was now included. Respondents were told about a diet workshop that could help reduce vulnerability to hypoglycemia, and this message was accompanied by either strong or weak supporting arguments.

In addition to our predictions described for Experiment 1, we propose that attitudes toward a protective action are objective evaluations of the provided information, and hence attitudes should be more positive when strong rather than when weak arguments are used in the action recommendation. However, the effect of argument quality on attitudes should be weaker in the condition in which both vulnerability and severity are high, because these respondents are defensively motivated to evaluate the recommendation positively.

Furthermore, weak arguments should induce more negative thoughts about the recommendation than strong arguments. We further predicted that vulnerable respondents would have more positive and fewer negative thoughts about the recommendation than non-vulnerable respondents. Because we expected a positive processing bias in particular when respondents felt vulnerable *and* when the consequences were depicted as severe, respondents in the condition of high vulnerability and severity should generate more positive and fewer negative thoughts about the recommendation than respondents in the other three conditions. To avoid an overly complex design and, more importantly, because no effects were found, source credibility manipulations were dropped.

Method

Participants and design

Respondents were 129 students of Utrecht University, who participated for payment of €3. Three respondents who expressed suspicion of the vulnerability manipulation were not included in the analysis, therefore the analyses were based on data from 126 (31 male, 95 female) respondents. Respondents were run individually and were randomly assigned in equal numbers to the conditions of a 2 (vulnerability) \times 2 (severity) \times 2 (argument quality) between-participants factorial design.

Independent variables

The same vulnerability and severity manipulations were used as in Experiment 1. In addition, we manipulated the quality of the arguments in the action recommendation.

Argument quality. The quality of the arguments was manipulated by presenting a recommendation, which contained either six strong or six weak

supporting arguments. Following the procedure described by Petty and Cacioppo (1986), these arguments were selected from a pool of arguments that had been rated as weak or strong in a pilot study. Examples of strong supporting arguments are: “Research has shown that people who participate in the hypoglycemia diet workshops develop hypoglycemia less often than people who do not participate”, and “After participating in the workshop 90% of the participants were able to cope better with their hypoglycemic complaints”. Weak supporting arguments included “Diet workshops are a lot of fun and good for social contacts”, and “If you participate in the diet workshop at least you do not have to blame yourself when you do become hypoglycemic”.

Procedure

The procedure was identical to Experiment 1 with the exception that after respondents were presented the severity message they received an action recommendation. In this communication the quality of the arguments supporting the action recommendation was varied. Respondents read a message promoting diet workshops to reduce vulnerability to hypoglycemia, which contained either six strong or six weak supporting arguments.

Manipulation checks

Checks of the manipulation of vulnerability and severity were assessed with the same items as used in Experiment 1. Argument quality was assessed by asking respondents to indicate, on 7-point rating scales ranging from 1 (not at all) to 7 (very) how strong, persuasive, and meaningful they found the arguments in the recommendation ($\alpha = .92$).

Dependent variables

The dependent variables of negative affect and cognitive responses regarding the severity message were identical to those in Experiment 1. In addition to the dependent variables assessed in Experiment 1 we also measured cognitive responses to the recommendation, and actual behavior.

Cognitive responses: Action recommendation. To measure the cognitive processing of the recommendation, respondents were asked to write down all their thoughts concerning the action recommendation. Separate boxes (five in total) were provided for each thought and respondents were requested to type each thought into a separate box. These thoughts were assessed independently from respondents' thoughts about the severity message.

Measures of persuasion. Attitude towards the diet workshop was measured by having respondents indicate on four semantic differential items with 7-point rating scales how useful, good, important, and effective they found the diet workshop ($\alpha=.90$). Intention to participate in the diet workshop was measured by three items with 7-point rating scales ranging from 1 (certainly not) to 7 (certainly): Do you have the intention to, do you want to, and are you going to participate in the diet workshop? ($\alpha=.93$). Two types of behavior were measured with one item each and yes/no response options. Respondents could ask for more information about the diet workshop and could sign up for it.

Results

Preliminary analyses showed that there were no gender effects on any of the dependent variables. Therefore three-way analyses of variance (ANOVAs) that included vulnerability, severity, and argument quality manipulations as factors were performed for all dependent measures, unless stated otherwise. The same planned contrasts were performed as in the previous experiment. In addition, planned contrasts were also performed for cognitive responses to the action recommendation, contrasting the high vulnerability/high severity condition with the three other conditions.

Manipulation checks

Vulnerability. A test of the manipulation of vulnerability revealed a main effect of vulnerability, $F(1, 118)=102.23$, $p<.001$, $\eta^2=.46$. Respondents perceived their vulnerability as higher in the high vulnerability condition ($M=4.35$) than in the low vulnerability condition ($M=2.44$). No other effects were found (all $F_s<2.3$).

Severity. The manipulation of severity was effective. Respondents who received the message depicting severe consequences of hypoglycemia perceived the consequences as more severe ($M=5.60$) than did those who received a message with low severity consequences ($M=4.21$), $F(1, 118)=85.78$, $p<.001$, $\eta^2=.42$. There also was a main effect of vulnerability, $F(1, 118)=7.68$, $p<.05$, $\eta^2=.06$. Non-vulnerable respondents found the consequences more severe ($M=5.13$) than did vulnerable respondents ($M=4.69$). No other effects were found (all $F_s<1.9$).

Argument quality. The manipulation of argument quality was also effective. Respondents who received strong arguments perceived the arguments as stronger ($M=4.99$) than did those who received weak arguments ($M=3.31$), $F(1, 118)=94.56$, $p<.001$, $\eta^2=.45$. No other effects were found (all $F_s<2$).

Dependent variables

Negative affect. Main effects of both vulnerability, $F(1, 118)=28.14$, $p<.001$, $\eta^2=.19$, and severity, $F(1, 118)=4.94$, $p<.05$, $\eta^2=.04$, were found (see Table 1). As expected, vulnerable respondents experienced more negative affect ($M=4.05$) than did non-vulnerable respondents ($M=3.06$) and the high severity message elicited more negative affect ($M=3.76$) than the message low in severity ($M=3.36$). No other effects were found (all $F_s<1.3$). Planned contrasts, contrasting the high vulnerability/high severity condition with the three other conditions, showed as predicted that vulnerable respondents in the high severity condition experienced more negative affect than did respondents in all other conditions, $F(1, 122)=21.84$, $p<.001$.

Cognitive responses: Severity message. Two independent raters scored respondents' thoughts about the severity message into several categories, including minimizing thoughts (range: 0–2; Kappa=.87). Minimizing thoughts were divided by total number of thoughts, which resulted in a minimizing thought ratio (range: 0–1). Respondents reported an average of 2.01 ($SD=.79$) thoughts in total (range: 1–5). A three-factor ANOVA on total number of thoughts about the severity message did not result in any significant effects.

Main effects of both severity, $F(1, 122)=10.67$, $p<.01$, $\eta^2=.08$, and vulnerability, $F(1, 122)=22.56$, $p<.001$, $\eta^2=.16$, were found, as predicted (Table 2). Respondents had relatively more minimizing thoughts when the consequences were high in severity ($M=.31$) than when severity was low ($M=.13$). Moreover, vulnerable respondents had relatively more minimizing thoughts ($M=.35$) than did non-vulnerable respondents ($M=.09$). No other effects were found (all $F_s<1$). Planned contrasts, contrasting the high vulnerability/high severity condition with the three other conditions, confirmed that vulnerable respondents under high severity reported relatively more minimizing thoughts than did respondents in all other conditions, $F(1, 122)=30.34$, $p<.001$.

Cognitive responses: Action recommendation. Two independent raters scored the number of thoughts about the recommendation in each of three categories: positive thoughts (range: 0–4; Kappa=.89), negative thoughts (range: 0–4; Kappa=.89), and neutral thoughts (range: 0–1; Kappa=.92) about the diet workshop. Examples of positive thoughts are: “I think the diet workshop is a great idea and I would love to participate” and “The diet workshop sounds very interesting”. Examples of negative thoughts are: “I do not think a diet workshop can really help you with hypoglycemia” and “I am not participating just so I do not have to blame myself if I do become

hypoglycemic". Because only few respondents (6.4%) listed neutral thoughts, no analyses were performed on neutral thoughts. Both positive and negative thoughts were divided by total number of thoughts, which resulted in positive and negative thought ratios (range: 0–1). Respondents reported an average of 2.71 ($SD=.90$) thoughts about the action recommendation (range: 1–5). A three-factor ANOVA on total number of thoughts about the recommendation did not result in any significant effects, as expected.

Analysis of the positive thoughts ratio showed a main effect of vulnerability, $F(1, 118)=12.02$, $p<.01$, $\eta^2=.09$ (see Table 4). As expected, vulnerable respondents reported relatively more positive thoughts about the recommendation ($M=.81$) than did non-vulnerable respondents ($M=.50$). No other effects were found. Planned contrasts, contrasting the high vulnerability/high severity condition with the three other conditions, confirmed that vulnerable respondents in the high severity condition reported relatively more positive thoughts than did respondents in all other conditions, $F(1, 122)=22.48$, $p<.001$.

On the negative thoughts ratio main effects of argument quality, $F(1, 118)=5.41$, $p<.05$, $\eta^2=.04$, and vulnerability, $F(1, 118)=10.08$, $p<.01$, $\eta^2=.08$, were found as predicted (Table 4). Respondents had relatively more negative thoughts about the action recommendation when it was supported by weak ($M=.41$) rather than strong arguments ($M=.28$), and vulnerable respondents had relatively fewer negative thoughts ($M=.26$) than did non-vulnerable respondents ($M=.44$). No other effects were found. Planned contrasts, contrasting the high vulnerability/high severity condition with the three other conditions, showed that, as predicted, vulnerable respondents in the high severity condition reported relatively fewer negative thoughts than did respondents in all other conditions, $F(1, 122)=13.40$, $p<.001$.

Attitude. There were main effects of argument quality, $F(1, 118)=26.26$, $p<.001$ ($\eta^2=.18$), and severity, $F(1, 118)=4.38$, $p<.05$, $\eta^2=.04$. Respondents

TABLE 4
Mean ratios (*SDs*) of positive and negative thoughts about the action recommendation by vulnerability and severity

	<i>Low vulnerability</i>	<i>High vulnerability</i>
<i>Positive thoughts</i>		
Low severity	.59 (.40)	.61 (.28)
High severity	.50 (.40)	.81 (.25)
<i>Negative thoughts</i>		
Low severity	.39 (.40)	.36 (.29)
High severity	.45 (.41)	.16 (.20)

had more positive attitudes towards the workshop when it was supported by strong ($M=5.42$) rather than by weak arguments ($M=4.56$). In addition, respondents had more positive attitudes when the consequences of hypoglycemia were presented as high ($M=5.16$) rather than low in severity ($M=4.82$). There was also a three-way interaction between argument quality, severity, and vulnerability, $F(1, 118)=6.75$, $p<.05$, $\eta^2=.05$ (Table 5).

Simple effect analyses revealed a main effect of argument quality for non-vulnerable respondents, $F(1, 122)=6.67$, $p<.05$, as well as a significant severity by argument quality interaction, $F(1, 122)=4.44$, $p<.05$, indicating that non-vulnerable respondents had more positive attitudes when strong arguments were used instead of weak ones, but only when the consequences were depicted as low in severity. Simple effect analyses revealed main effects of argument quality, $F(1, 122)=18.28$, $p<.001$, and severity, $F(1, 122)=5.19$, $p<.05$, for vulnerable respondents, but no significant severity by argument quality interaction, $F(1, 122)=1.80$, $p=.18$. Vulnerable respondents had more positive attitudes when severity was high, and when strong arguments were used.

Intention. There was only a vulnerability main effect, $F(1, 118)=20.13$, $p<.001$, $\eta^2=.15$, as expected. Respondents had a higher intention to participate in the workshop when their vulnerability was high ($M=3.60$) than when their vulnerability was low ($M=2.60$; Table 5). For all other effects, $F_s<2.7$.

TABLE 5
Means (*SDs*) of attitude and intention by vulnerability, severity,
and argument quality (Experiment 2)

	<i>Low vulnerability</i>	<i>High vulnerability</i>
<i>Attitude</i>		
<i>Low severity</i>		
Weak arguments	4.38 (1.33)	4.26 (.78)
Strong arguments	5.61 (.78)	5.00 (.81)
<i>High severity</i>		
Weak arguments	5.08 (1.33)	4.50 (.74)
Strong arguments	5.20 (.93)	5.90 (.77)
<i>Intention</i>		
<i>Low severity</i>		
Weak arguments	2.47 (.97)	3.13 (1.03)
Strong arguments	2.79 (1.48)	3.65 (1.28)
<i>High severity</i>		
Weak arguments	2.92 (1.54)	3.54 (1.30)
Strong arguments	2.21 (1.11)	4.11 (1.26)

Behavior. Logistic regression analyses were used to assess the impact of the independent variables on the two measures of behavior. This showed a main effect of vulnerability on requests for information, $Wald(1)=5.61$, $p<.05$. Vulnerable respondents more often requested information about the recommendation (52.4%) than did non-vulnerable respondents (31.7%). No other effects were found. For actual signing up, again only a main effect of vulnerability was found, $Wald(1)=7.70$, $p<.01$. Vulnerable respondents signed up more often (25.4%) than did non-vulnerable respondents (6.3%).

Mediation

A series of hierarchical regression-analyses were performed to assess a possible mediation of the effects of argument quality and severity on attitudes, and of the effect of vulnerability on intention, and behavior, by affect and cognitions. Following procedures specified by Baron and Kenny (1986), variables were only entered as possible mediators if three conditions were met: (1) the independent variable affected the mediator, (2) the independent variable affected the dependent variable, and (3) the mediator affected the dependent variable. Which variables met conditions 1 and 2 can be derived from the analyses of variance described above; which variables also met condition 3 can be found in the correlation table (see Table 6).

With respect to the effect of argument quality on attitude, only negative thoughts about the recommendation qualified as a mediator. Positive thoughts about the recommendation, negative affect, and minimizing thoughts about the fear appeal were unaffected by argument quality and therefore did not qualify as possible mediators. Hierarchical regression analysis showed that adding negative thoughts about the recommendation

TABLE 6
Correlations between all dependent variables (Experiment 2)

Variable	1	2	3	4	5	6	7
1. Negative affect	–						
2. Minimizing thoughts fear appeal	.09	–					
3. Positive thoughts recommendation	.21*	.30**	–				
4. Negative thoughts recommendation	–.19*	–.11	–.52***	–			
5. Attitude	.01	.00	.26**	–.40***	–		
6. Intention	.48***	.20*	.30**	–.16	.26**	–	
7. Request for information	.16	.02	.10	–.15	.01	.55***	–
8. Subscription	.11	.18*	.18*	–.22*	.14	.55***	.29**

* $p<.05$. ** $p<.01$. *** $p<.001$.

to the model that regressed attitude from argument quality did not reduce the effect of argument quality to non-significance (Table 7). However, the effect was reduced and a Sobel test (Baron & Kenny, 1986) of mediation was significant ($Z=2.41$, $p<.01$). Thus, negative thoughts partly mediated the effect of argument quality on attitude.

No variable qualified as possible mediator of the effect of severity on attitude. Positive thoughts and negative thoughts about the recommendation were unaffected by severity and therefore did not qualify as possible mediators. Negative affect and minimizing thoughts about the fear appeal

TABLE 7
Hierarchical regression analyses predicting attitudes, intentions, and behavior
(Experiment 2)

<i>Dependent variable: Attitude</i>		β	R^2		
<i>Step 1</i>					
Argument quality		.40***	.16***		
<i>Step 2</i>					
Argument quality		.32***			
Negative thoughts		-.32***	.25***		
<i>Dependent variable: Intention</i>		β	R^2		
<i>Step 1</i>					
Vulnerability		.37***	.13***		
<i>Step 2a</i>					
Vulnerability		.27**			
Positive thoughts		.36***	.24***		
<i>Step 2b</i>					
Vulnerability		.20*			
Negative affect		.39***	.25***		
<i>Step 3</i>					
Vulnerability		.14 <i>ns</i>			
Negative affect		.34***			
Positive thoughts		.31***	.33***		
<i>Dependent variable: Behavior</i>		<i>Request for information</i>		<i>Subscription</i>	
		β	R^2	β	R^2
<i>Step 1</i>					
Vulnerability		.21*	.04*	.26**	.06**
<i>Step 2</i>					
Vulnerability		.01 <i>ns</i>		.07 <i>ns</i>	
Intention		.54***	.29***	.52***	.29***

* $p<.05$. ** $p<.01$. *** $p<.001$.

did not have a significant correlation with attitudes and therefore also did not qualify as mediators.

With respect to the effect of vulnerability on intention, negative affect, minimizing thoughts about the fear appeal, and positive thoughts about the recommendation all qualified as potential mediators. Because negative thoughts about the action recommendation did not have a significant correlation with intention, these thoughts did not qualify as a mediator. When minimizing thoughts were added to the model that regressed intention from vulnerability, the effect of minimizing thoughts was non-significant ($\beta = .09$, *ns*), and moreover did not reduce the effect of vulnerability on intention. Therefore minimizing thoughts about the fear appeal did not operate as a mediator. In contrast, separately entering negative affect and positive thoughts about the recommendation into the regression equation each substantially reduced the effect of vulnerability on intention (Table 7). The combined effect of negative affect and positive thoughts on intentions reduced the effect of vulnerability on intention to non-significance. Tests of mediation were significant for both negative affect ($Z = 3.96$, $p < .001$) and positive thoughts ($Z = 2.81$, $p < .01$). Hence, the effect of vulnerability on intention was mediated by negative affect in view of the health consequences of hypoglycemia and positive thoughts about the action recommendation.

Minimizing thoughts about the fear appeal, negative and positive thoughts about the action recommendation, and intention qualified as possible mediators for the effect of vulnerability on subscription, whereas only intention qualified as possible mediator of the effect on requesting information. When minimizing thoughts about the fear appeal, and negative thoughts and positive thoughts about the action recommendation, were separately added to the model that regressed subscription from vulnerability, the effect of minimizing thoughts ($\beta = .11$, *ns*), negative thoughts ($\beta = .08$, *ns*), and positive thoughts ($\beta = .13$, *ns*) all were non-significant, and did not reduce the effect of vulnerability on subscription. Therefore these variables did not operate as mediators. Entering vulnerability and intention into hierarchical regression with subscription as criterion reduced the vulnerability effects on this behavioral measure to non-significance (Table 7). The same was found when vulnerability and intention were entered into the regression with requesting information as outcome. Tests of mediation were significant both for requesting information ($Z = 3.78$, $p < .001$), and for signing up for the workshop ($Z = 3.78$, $p < .001$). Thus the effect of vulnerability on behavior was mediated by intention.

Discussion

This study revealed a negative bias in processing the fear appeal, as well as a positive bias in processing the action recommendation. We found the same

pattern of results with regard to the processing of the fear appeal as observed in Experiment 1. Vulnerable respondents in the high severity condition experienced more negative affect than respondents in all other conditions. More importantly, vulnerable respondents under high severity also reported relatively more minimizing thoughts than any other respondents. Further evidence of biased processing of threat information was found in an effect of vulnerability on the manipulation check of severity, indicating that vulnerable respondents perceived the described consequences of hypoglycemia as less severe than did non-vulnerable respondents.

A defense-motivated positive bias was shown in processing the action recommendation. Vulnerable respondents in the high severity condition reported more positive thoughts and fewer negative thoughts about the recommendation than respondents in all other three conditions. Support for the assumption that this was the result of biased systematic processing comes from the finding that the increase in positive thoughts emerged regardless of the quality of the arguments supporting the recommendation. However, the fact that the attitudes of vulnerable respondents towards the action recommendation were also influenced by argument quality indicates that some systematic processing had occurred.

In contrast to Experiment 1, in this study in which an action recommendation was offered we found main effects of argument quality and severity on attitudes. Respondents had a more positive attitude towards the recommendation when strong rather than weak attitudes were used. In addition, we found that severe consequences resulted in more positive attitudes. The significant three-way interaction effect showed that whereas vulnerable respondents had more positive attitudes when strong arguments were used and when the consequences were depicted as severe, for non-vulnerable respondents attitudes were mainly determined by argument quality, but only when the consequences were depicted as low in severity. It seems that for non-vulnerable respondents the effectiveness of the recommendation (as indicated by argument quality) is the most important factor in determining their attitudes, whereas for vulnerable respondents it is also important how severe the consequences of a health risk are.

Whereas attitude was mainly determined by argument quality, as well as by severity, persuasion measures with behavioral implications (i.e., intention and behavior) were only influenced by vulnerability, as expected. Vulnerable respondents had a higher intention to participate in the workshop, more often requested additional information, and signed up for it more often than did non-vulnerable respondents. Mediation analyses showed that the vulnerability effect on intention was mediated by negative affect aroused by the fear appeal and positive thoughts about the recommended action, whereas the vulnerability effects on behavior were mediated by intention.

A final question addressed in this experiment concerned the impact of the defensive appraisal of the fear appeal on the appraisal of the recommended action. One could argue that the more individuals minimize a health threat, the less they should be willing to accept the recommended action. However, minimizing thoughts about the fear appeal correlated positively with positive thoughts about the action recommendation, as well as with intention to sign up for the workshop and actually signing up. It seems that defense-motivated biased processing of the fear appeal actually had a positive effect on the processing of the action recommendation and persuasion.

GENERAL DISCUSSION

The studies presented in this paper extend our previous findings (Das et al., 2003; De Hoog et al., 2005) by exploring the processing of the fear appeal, and relating processing of the fear appeal to processing of the action recommendation and providing more insight into the underlying processes that lead to intentions and behavior. Both experiments provided evidence for a negative bias in the processing of a fear appeal, with vulnerable respondents presented with a message depicting severe health consequences of hypoglycemia reporting more minimizing thoughts about the fear appeal than respondents in all other conditions. In Experiment 2 we also found that vulnerable respondents perceived the health consequences as less severe than non-vulnerable respondents.

This experiment further provided evidence of a positive bias in processing the action recommendation. It also showed how the negative bias in appraising threat and the positive bias in appraising protective actions resulted in increased persuasion. We found a positive bias in the processing of the action recommendation, with vulnerable respondents in the high severity condition having more positive and fewer negative thoughts about the recommendation than respondents in all other conditions. This generating of positive thoughts about the recommendation occurred regardless of the quality of the arguments supporting the recommendation. For vulnerable respondents, quality of the arguments also had no effect on their intentions and behaviors, even though they did affect their attitudes. This is in line with assumptions of the stage model that attitudes are the outcome of a purely informational evaluation, whereas persuasion outcomes that have behavioral implications are dominated by perceptions of vulnerability.

Mediation analyses provided more insight into how information processing of both the fear appeal and the action recommendation affected persuasion. In processing the fear appeal, vulnerable respondents experienced more negative affect, and their negative processing bias showed itself

in more minimizing thoughts about the fear appeal. Their subsequent processing of the action recommendation, however, resulted in more positive thoughts about the recommendation, and these positive thoughts together with the negative affect elicited by the fear appeal, mediated the effect of vulnerability on intention.

Minimizing thoughts regarding the fear appeal correlated positively with positive thoughts about the recommendation as well as behavioral intentions, indicating that minimizing thoughts about the fear appeal contributed to increased persuasion. It seems that the negative bias in processing the fear appeal, which results in minimizing thoughts, is positively related to positive thoughts aroused by processing of the subsequent recommended action. In other words, it is not the case that vulnerability to a severe health risk that induces defense motivation results in either minimization of the threat or only in maximization of the recommended action, but rather the negative processing bias in threat appraisal actually contributes to the positive processing bias in coping appraisal. These findings are in line with theoretical reasoning by Wiebe and Korbel (2003), who also propose that biased interpretation of threat information may not obstruct adaptive health behavior, and can actually facilitate problem-focused responses by keeping potentially disruptive emotions in check.

The present studies emphasize the importance of vulnerability for intentions and behavior. Even though both severity and efficacy play a role in attitude, intention, and behavior change, it was clearly perceptions of vulnerability that motivated respondents to take protective action. This is in contrast with a lot of previous fear appeal research that has often downplayed the role of vulnerability and instead stressed the importance of severity. Some of this is because of the way in which vulnerability is assessed. Some studies used factual measures of vulnerability instead of assessing perceptions, for example, by comparing smokers and non-smokers, or coffee drinkers and non-coffee drinkers (e.g., Beck & Davis, 1978; Block & Williams, 2002), whereas we emphasize the importance of those people who belong to a vulnerable group to actually *feel* vulnerable. Furthermore, a large proportion of studies on fear appeals do not differentiate between vulnerability and severity in their manipulations, making it impossible to assess the impact of both factors separately (e.g., Janis & Feshbach, 1953; Morman, 2000).

Our findings with regard to attitudes vary across studies. The first experiment, in which no recommendation was offered, showed no effects of severity and vulnerability on attitude. In the second experiment, which included an action recommendation, respondents held a more favorable attitude towards the diet workshop when the recommendation was supported by strong rather than weak arguments, and when the consequences were severe rather than minor. These different effects for

attitudes could indicate that individuals' attitude toward a protective action is not affected by a fear appeal, unless a protective action has been specifically recommended in the communication.

Furthermore, the *type* of recommendation offered might also explain these conflicting results. In Experiment 1 respondents were advised to be tested for hypoglycemia and in Experiment 2 it was recommended that they followed a food workshop. When asked how one feels about getting tested for a disease, one might be naturally inclined to think this is a good thing to do, regardless of the severity of the depicted consequences. After all, even the mild consequences were troublesome, and being tested does not require a great deal of effort. In contrast, attending a food workshop does require substantial time investment and this fact might warrant a closer look at the severity of the consequences and the efficacy of the recommended actions. An alternative explanation could be the fact that we deal here with two different kinds of recommendations, namely detection vs protection behaviors, which have been shown to have different effects (Rothman & Salovey, 1997).

The reported experiments demonstrate that exposing vulnerable respondents to a severe health risk arouses defense motivation, which manifests itself not only in avoidance reactions as previous fear appeal models have proposed (e.g., Witte, 1992), but in biased systematic processing. Vulnerable respondents experienced most negative affect after exposure to the high severity message and this elicited minimizing thoughts. Yet, when it came to processing of a possible solution to the threat, vulnerable respondents had more positive thoughts about the recommended protective action and a stronger intention to change their behavior. Efficacy information (as depicted by argument quality in Experiment 2) had no impact on vulnerable respondents' intentions and behavior to engage in a protective behavior.

This is in contrast with assumptions of most other fear appeals theories (Rogers, 1983; Witte, 1992) that predict threat by efficacy interactions, with vulnerable individuals only adopting protective actions when the action recommendation is portrayed as effective in averting negative consequences. It has to be mentioned that in our studies we only looked at response efficacy, whereas most studies conducted by Witte and colleagues include both response efficacy and self-efficacy in their efficacy measures. Therefore, no definite conclusions can be drawn from this.

A further limitation of the present studies is that the behavioral measures we used are rather limited. Even though we feel that having respondents request information, and actually signing up to take part in a protective action, goes beyond intentions and qualifies as some kind of behavioral measure, we realize this is still a long way off from measuring actual behavior. Because the present studies employ a manipulation of vulnerability as well as a fake action recommendation, it would be impossible to assess more actual behavior. However, future studies could use a different

paradigm where respondents could be asked at a later date whether or not they had really performed any protective actions.

The studies in this paper have shed some light on the underlying processes that mediate the persuasive impact of fear appeals. The one clear finding that has emerged from the present studies, as well as from our earlier experiments, is the importance of vulnerability for intentions and behavior. This finding has important theoretical as well as practical implications. In both health education campaigns and empirical research the emphasis is often on the effects of the severity of health consequences, and on the efficacy of protective actions. However we have shown that although these factors affect attitudes, they fail to have much of an impact on intentions and behavior. Intentions and behavior were solely determined by feelings of vulnerability. This suggests that, however severe a health risk, and however effective the protection offered by the recommendation, unless we can persuade individuals that they are vulnerable to the health risk, they are unlikely to take protective action.

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