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Fear Appeals Motivate Acceptance of Action Recommendations: Evidence for a Positive Bias in the Processing of Persuasive Messages

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Three experiments are reported that tested the hypothesis that the use of fear appeals in health persuasion may lead to positively biased systematic processing of a subsequent action recommendation aimed at reducing the health threat and, consequently, to more persuasion, regardless of the quality of the arguments in the recommendation. The levels of participants' vulnerability to as well as the severity of a health risk were varied independently, followed by a manipulation of the quality of the arguments in the subsequent action recommendation. The dependent variables included measures of persuasion (attitude, intention, and action), negative affect, and cognitive responses. The results show that participants who felt vulnerable to the health threat were more persuaded, experienced more negative emotions, and had more favorable cognitive responses. Both negative emotions concerning one's vulnerability and positive thoughts concerning the recommendation mediated the effects of vulnerability on persuasion.

Keywords: *fear appeal; vulnerability; severity; behavior change; persuasion; biased processing*

Fear appeals have long been used in health education to motivate people to adopt healthy lifestyles. Extensive research conducted on the effectiveness of fear appeals in changing attitudes and behavior between 1950 and 1970 resulted in a complex body of often inconsistent findings (see Leventhal, 1970). This article will present a stage theory of the processing of fear-arousing communications, which will reconcile some major inconsistencies in the patterns of findings reported in this literature. We will also present three experiments designed to test central predictions from our model.

Early Theoretical Perspectives

Early research on fear arousal has been guided theoretically by the assumption that fear is a learned drive and that protective recommendations will be accepted if they are effective in reducing fear (e.g., Hovland, Janis, & Kelley, 1953). Because part of the empirical evidence was inconsistent with this drive model, Leventhal (1970) developed the parallel response model. This introduced threat appraisal as the mediator between environmental threat and action and abandoned the notion that emotional arousal is a necessary antecedent of the adaptation to danger. A weakness of the model is that it does not specify the processes of cognitive evaluation that precede the action tendencies. This task was completed by later models that focused exclusively on cognitive processes, namely, the health belief model (e.g., Rosenstock, 1974) and protection motivation theory (e.g., Rogers & Mewborn, 1976). Despite fundamental differences in their assumptions about underlying processes, all of these models predict that individuals are more likely to accept a recommendation the greater the threat, but only if the recommendation is seen as an effective way to reduce the threat. Protective actions that

are perceived as ineffective in averting the negative consequences will not be adopted.

The empirical evidence is only partly consistent with these predictions. Although the vast majority of experiments have found that higher levels of threat lead to greater persuasion (Sutton, 1982), manipulation of the effectiveness of the recommended action resulted only in main effects (e.g., Chu, 1966; Maddux & Rogers, 1983) rather than the predicted interaction between threat and effectiveness (see Eagly & Chaiken, 1993; Rogers & Prentice-Dunn, 1997). Particularly damaging have been findings revealing that increases in the severity of a threat had less impact on those who felt vulnerable than on those who did not (e.g., Berkowitz & Cottingham, 1960).

Interpretations Based on Dual-Process Theories of Attitude Change

Interpretations of the impact of fear appeals in terms of dual-process theories focus on information processing as well as persuasive outcomes. As Gleicher and Petty (1992) and Liberman and Chaiken (1992) have argued, fear arousal can have two different effects, namely, act as a motivator to induce intensive (and accurate) message processing or induce defense motivation. Because defense motivation will be aroused when self-definitional beliefs are being threatened (e.g., the belief that one is healthy and safe), defense motivation is most likely to be induced when the health threat is both severe and personally relevant. According to the multiple motive version of the Heuristic-Systematic Model, (a) the processing goal of defense-motivated recipients is to confirm the validity of particular attitudinal positions and disconfirm the validity of others and (b) both heuristic and systematic processing modes can serve the defense-motivated recipients to reach this goal (Chaiken, Liberman, & Eagly, 1989; Chen & Chaiken, 1999). Thus, defense-motivated individuals will process information selectively in the way that best supports their own beliefs. This implies that information that is congruent with a particular preferred attitudinal position will be evaluated less critically and judged as more valid than information that is incongruent with this belief (Ditto & Lopez, 1992; Lord, Ross, & Lepper, 1979; Pyszczynski & Greenberg, 1987; Pyszczynski, Greenberg, & Holt, 1985).

A Stage Model of the Processing of Fear-Arousing Communications

Integrating these assumptions with ideas from cognitive stress theory (e.g., Lazarus & Folkman, 1984), we suggest a stage model of the processing of fear-arousing information. In line with dual-process theories, our model assumes that the processing of fear-arousing communication and fear-induced persuasion will depend on an individual's processing motivation. Depending on the severity of the threat and on an individual's perceived vulnerability, processing motivation can range from systematic to heuristic, from accuracy motivated to defense motivated, and from negatively biased to positively biased. In line with cognitive stress theories, our model assumes that individuals exposed to a fear-arousing communication will engage in two types of appraisal, namely, appraisal of the threat and appraisal of coping strategies available for reducing the threat. These two appraisal processes match the two components of fear communications, namely, (a) the fear appeal, which emphasizes the severity of, and vulnerability to, a threat; and (b) the action recommendation, which provides information on how to avoid the health threat. Because these two parts differ in the extent to which the message they convey is consistent with the preferred attitudinal position of the recipient, defense motivation should exert opposite effects on the primary appraisal of the threat and on the secondary appraisal of the coping strategies.

Information that makes the individual feel vulnerable to a nontrivial health threat is likely to induce both systematic processing motivation and a negative processing bias in the primary appraisal process because a fear appeal contains preference-inconsistent information. The negative bias involves attempts to minimize the health threat by means of a biased search for inconsistencies and logical errors and a biased evaluation of presented evidence in the direction of the preferred conclusion. There is now ample empirical support for these predictions (Ditto & Lopez, 1992; Jemmot, Ditto, & Croyle, 1986; Kunda, 1987; Liberman & Chaiken, 1992; Reed & Aspinwall, 1998, Sherman, Nelson & Steele, 2000).

Because attempts to downgrade the health threat will be constrained by evidence and rules of inference, individuals will be unlikely to completely reject the threat if the evidence presented is reasonably persuasive. Thus, defense motivation will continue to exist in the processing of action recommendations (secondary appraisal). Because action recommendations present preference-consistent information (i.e., protection against the health threat), this information will be processed with a positive bias. At this stage, individuals will want reassurance. Although the easiest way to feel reassured would be to accept the recommendation without scrutinizing the arguments contained in the message, it is not likely that heuristic processing strategies will prevail when processing motivation is high and the presented information is relevant. We therefore propose that inducing vulnerability to a severe health threat will motivate individuals to process the action recommendation in a manner that is

both biased and systematic. This processing will involve attempts to make the recommendation appear highly effective by means of biased search for arguments supporting the effectiveness of the protective action and through biased evaluation of these arguments. This type of processing is likely to result in increased persuasion regardless of the quality of the arguments supporting this recommendation.

Because fear-arousing communications are usually designed to make individuals feel vulnerable to a severe health threat, the use of fear is unlikely to result in an objective evaluation of the action recommendation. It can, however, be speculated that under conditions of low vulnerability, increases in severity of a health threat will result in increased systematic objective processing motivation. After all, it is worthwhile thinking about some serious threat (e.g., an epidemic in a distant country) even if it is of no immediate relevance.

Empirical Evidence

There is only one published study that assessed the processing of action recommendations following threatening information (Gleicher & Petty, 1992). However, a study by Jepson and Chaiken (1990) assessed a related issue, namely, the effects of chronic fear on message processing. They reported that participants with chronic fear of cancer detected fewer errors in a message on cancer checkups and listed fewer issue-relevant thoughts than did nonfearful participants. However, fearful participants did agree more with the message. These findings suggest that chronic fear of cancer led to less critical processing and to motivated acceptance of an action recommendation.

Of more direct relevance is the study of Gleicher and Petty (1992), who induced low or moderate fear in students either about crime (relevant threat) or about an illness on campus (irrelevant threat). Students were then presented with a message about a new crime watch program. At the beginning of the message, a heuristic cue was presented implying either that the (credible) source expected the program to be effective or doubted its effectiveness. Cross-cutting this manipulation, either weak or strong supporting arguments were presented. In line with predictions, argument quality resulted in a main effect on students' attitude toward the crime watch program under low fear and in an interaction with the effectiveness expectation under moderate fear (no effect of argument quality with clear expectations). However, inconsistent with predictions, these effects occurred not only when the fear message was relevant but also with an irrelevant fear appeal.

Apart from this troubling inconsistency, the findings of this study leave three important issues unaddressed: First, we cannot assess how a persuasive message is processed when no heuristic cue about the efficacy of a recommendation is presented. Second, due to the absence of processing measures, only indirect information on processing is available (i.e., argument quality effects). Third, the question of what levels of vulnerability and/or severity evoke defense motivation has not been addressed.

Overview

The studies reported in this article were designed to assess the prediction that increases in vulnerability to a health risk will induce a systematic positive bias in the processing of subsequently presented recommendations, resulting in increased persuasion, regardless of the quality of the arguments in this recommendation. Our studies varied vulnerability to and the severity of a health threat, as well as the quality of the arguments in a recommendation. Furthermore, following Petty and Wegener (1999, p. 5) we decided to use additional indicators of intensity and direction of message processing, namely, the number of issue-relevant thoughts, the profile of issue-relevant thoughts, and the relation between issue-relevant thoughts and measures of persuasion.

EXPERIMENT 1[1]

Method

DESIGN AND PARTICIPANTS

The hypotheses were tested in a 2 (vulnerability) × 2 (severity of health consequences) × 2 (argument quality in the action recommendation) factorial design. A total of 184 male and female students at Utrecht University received Fl. 10 (5 Euro) for participating in the experiment.

PROCEDURE

Participants were told that they would be completing a survey on stress-related health problems. This survey would contain questionnaires as well as texts. First, participants' self-perceived vulnerability to stress was measured. This item was presented in between filler items. Next, severity of the health consequences of stress was manipulated by presenting participants with one of two different texts on the health consequences of stress. Consequences were described as mild (e.g., fever or cold hands and feet) in the low-severity condition and as quite serious (e.g., stomach ulcers or heart disease) in the high-severity condition. Following this manipulation, participants were presented with a fictitious letter submitted to an American health journal, which described stress management training as a way to reduce the risk of stress-related illnesses. This persuasive message contained either three weak or three strong supporting arguments. These arguments had either been selected

from a pool of arguments that had been rated as weak or strong in a pilot study (Petty & Cacioppo, 1986). After completing the dependent measures, participants were very carefully debriefed.

INDEPENDENT VARIABLES

Vulnerability was measured on the basis of a risk-perception item, measuring participants' self-rated likelihood of ever suffering from stress-related illnesses on a 9-point scale (1 = *very small*, 9 = *very high likelihood*). Using a median split procedure,[2] participants were next divided into a low- ($n = 101$, $M = 3.44$) and a high- ($n = 83$, $M = 6.73$) vulnerability group ($Mdn = 5$). Severity (low, high) was manipulated by describing the consequences of stress either as very mild or rather severe. Argument quality (low, high) was manipulated by using either three strong or three weak arguments supporting the action recommended selected on the basis of a pilot study.

MANIPULATION CHECKS

The severity manipulation was assessed by having participants rate on 9-point scales how severe and alarming they thought the health consequences of stress were ($r = .44$). Perceived argument quality of the action recommendation was assessed by one item, asking participants to rate on a 9-point scale how good or bad they thought the arguments were (1 = *very bad quality*; 9 = *very good quality*).

DEPENDENT MEASURES

Measures of persuasion. Participants' attitude toward the stress management training was assessed with five semantic differentials, measuring on 9-point scales how useful, positive, important, interesting, and reliable participants perceived the training to be ($\alpha = .91$). The intention to participate in a stress management training was measured on a 9-point scale (1 = *definitely not*, 9 = *definitely*).

Negative affect. To allow for the possibility that a fear appeal will evoke not only emotions of fear but various other negative emotions as well, a general measure of negative affect was used. Stress-related negative affect was assessed with four semantic differentials, measuring how good, depressed, anxious, and positive participants felt about their vulnerability to stress ($\alpha = .93$). Lower scores on the scale indicate more negative emotions (1 = *negative*, 9 = *positive*).

Processing measures. To assess the amount and valence of cognitive processing of the action recommendation, a thought-listing task was added. Participants were asked to write down the thoughts they had while reading the action recommendation concerning the stress management training.

Results

MANIPULATION CHECKS

Analyses of variance conducted on the manipulation checks revealed that both manipulations were successful. A 2 (perceived vulnerability) × 2 (severity) × 2 (argument quality) factor ANOVA conducted on the severity index yielded a severity main effect, $F(1, 179) = 18.99$, $p < .001$. Participants in the high-severity condition rated the consequences of stress as more severe than did participants in the low-severity condition ($M_{high} = 6.65$ vs. $M_{low} = 5.64$). A similar ANOVA on the manipulation check for argument quality revealed that the quality of the arguments in the action recommendation was perceived as higher in the strong-arguments condition ($M_{strong} = 5.83$) than in the weak-arguments condition ($M_{weak} = 4.57$), $F(1, 173) = 20.00$, $p < .001$. No further effects were found.

DEPENDENT MEASURES

Persuasion. A 2 (perceived vulnerability) × 2 (severity) × 2 (argument quality) factor ANOVA conducted on the attitude toward the stress management training revealed a main effect for vulnerability, $F(1, 169) = 9.97$, $p < .01$. More favorable attitudes toward the recommended solution were reported when participants felt vulnerable to stress ($M = 6.31$) than when participants did not feel vulnerable to stress ($M = 5.58$). In addition, a marginally significant three-way interaction between vulnerability, severity, and argument quality was observed, $F(1, 169) = 3.51$, $p < .06$. Simple effects analyses revealed that an increase in the level of severity led to a near significant differentiation between strong and weak arguments under conditions of low vulnerability, $F(1, 172) = 3.67$, $p = .06$. Under conditions of high vulnerability, no significant simple effects were observed (see Table 1, top panel).

A similar ANOVA on the intention to participate in a stress management training revealed only a significant main effect of vulnerability, $F(1, 173) = 13.18$, $p < .001$. When vulnerability was high, the intention was higher ($M_{high} = 5.01$) than when vulnerability was low ($M_{low} = 3.88$). No effects of severity or argument quality and no interactions were found.

Negative affect. A 2 (perceived vulnerability) × 2 (severity) × 2 (argument quality) factor ANOVA conducted on negative affect revealed a main effect of vulnerability, $F(1, 169) = 23.35$, $p < .001$. When participants felt vulnerable to stress, they experienced more negative emotions ($M = 6.81$) than when they did not feel vulnerable to stress ($M = 7.81$).

Processing measures. Two independent raters scored the number of thoughts in each of three categories: positive (range 0-4; Kappa = .72), negative (range 0-5; Kappa

TABLE 1:   Means (*SD*s) of Attitudes Toward Recommended Action by Severity of, and Vulnerability to, Health Threat and Argument Quality in Experiments 1, 2, and 3

	Weak Arguments	n	Strong Arguments	n
Experiment 1[a]				
Low vulnerability				
Low severity	5.64 (.32)	22	5.38 (.32)	22
High severity	5.31 (.28)	30	6.06 (.31)	23
High vulnerability				
Low severity	6.00 (.33)	21	6.49 (.32)	22
High severity	6.50 (.38)	16	6.28 (.33)	21
Experiment 2[b]				
Low vulnerability				
Low severity	4.08 (.29)	12	4.63 (.29)	12
High severity	3.99 (.25)	16	4.55 (.31)	11
High vulnerability				
Low severity	4.98 (.25)	16	5.17 (.25)	16
High severity	5.01 (.29)	12	5.23 (.25)	16
Experiment 3[b]				
Low vulnerability				
Low severity	4.38 (.23)	15	4.63 (.25)	13
High severity	4.87 (.23)	16	5.16 (.23)	16
High vulnerability				
Low severity	4.86 (.25)	13	5.12 (.25)	16
High severity	4.79 (.23)	16	4.94 (.23)	16

a. 9-point scale. Higher values indicate more positive attitude.
b. 7-point scale. Higher values indicate more positive attitude.

= .72), and neutral thoughts (range 0-5; Kappa = .70) concerning the action recommendation. A three-factor ANOVA conducted on the total number of thoughts revealed a main effect of vulnerability, $F(1, 168) = 7.22$, $p < .01$: Participants who felt vulnerable to the health risk listed more thoughts ($M = 2.29$) than participants who did not feel vulnerable ($M = 1.79$). No further effects were observed on the total amount of thoughts listed. A 2 × 2 × 2 ANOVA on the number of positive thoughts revealed a main effect of vulnerability, $F(1, 168) = 8.47$, $p < .01$. When vulnerability was high, more positive thoughts were elicited ($M = 1.24$) than when vulnerability was low ($M = 0.82$). No effects of severity and argument quality were observed. A similar ANOVA conducted on the number of negative thoughts revealed a main effect of argument quality, $F(1, 168) = 5.89$, $p < .05$. Weak arguments elicited more negative thoughts ($M = 1.11$) than did strong arguments ($M = 0.71$). No further effects were found on this dependent measure. On neutral thoughts, no effects of the independent variables were found.

MEDIATION

To assess a possible mediation of the effects of vulnerability on measures of persuasion by either negative emotions concerning the health threat or by thoughts about the recommended solution, hierarchical regression analyses were performed on attitudes and intentions with negative affect and positive thoughts about the action recommendation entered as predictors. Following Baron and Kenny (1986), variables were only entered as possible mediators if the following three conditions were met: (a) The independent variable affected the mediator, (b) the independent variable affected the dependent variable, and (c) the mediator affected the independent variable. These conditions were met by positive thoughts as a possible mediator for the effects of vulnerability on attitudes (but not intentions) and negative affect as a possible mediator for vulnerability on intentions (but not on attitudes). Negative thoughts were not entered as a mediator because these thoughts were not affected by vulnerability. All selected variables were entered as continuous measures, with the exception of perceived vulnerability, which was dummy coded (low, high).

The analyses revealed that the effect of vulnerability on attitudes was mediated by positive thoughts concerning the action recommendation: Higher levels of vulnerability induced more positive thoughts about the action recommendation, which in turn led to more positive attitudes toward this recommendation. Because attitude is assumed to be a major determinant of intention (Ajzen, 1988), we entered attitude in addition to negative affect in assessing the effect of vulnerability on intention. Attitudes were found to mediate the main effect of vulnerability on intention. In addition, stress-related negative affect significantly added to the mediating effect of attitudes: Higher levels of vulnerability induced more negative affect, which directly led to higher intentions (see Table 2).

Discussion

The attitude data provide support for our hypotheses. When participants felt that they were vulnerable to stress, their attitude toward the action recommendation was more positive than when they did not feel vulnerable. This main effect was moderated by a marginally significant interaction between vulnerability, severity, and argument quality. As predicted, increases in severity of the health risk resulted in a more positive attitude toward the recommended action when the recommendation was supported by strong rather than weak arguments. Thus, when vulnerability was low, increasing severity increased individuals' motivation to scrutinize the arguments. Although this pattern appeared to be reversed under conditions of low vulnerability, analysis of the simple effects revealed that the differentiation between strong and weak arguments was not significant when vulnerability was high and severity low. Thus, inducing high vulnerability resulted in a positive attitude toward the action recommendation, regardless of severity and, more important, regardless of the quality of the arguments.

TABLE 2:   Results of Hierarchical Regression Analyses Predicting Attitudes, Intentions, and Request for Information in Experiments 1, 2, and 3

Dependent Variable	Experiment 1		Experiment 2		Experiment 3	
	β	ΔR^2	β	ΔR^2	β	ΔR^2
Attitude						
Step 1						
Vulnerability	.23**	.06**	.38***	.14***		
Step 2						
Vulnerability	.12^{ns}		.25**			
Positive thoughts	.44***		.37**		.27***	
Intention						
Step 1						
Vulnerability	.25***	.06***	.56***	.31***	.27**	.07**
Step 2						
Vulnerability	.09^{ns}		.42***		.23**	
Attitudes	.65***	.40***	.37***	.11***	.47***	.22***
Step 3						
Vulnerability	.03^{ns}		.35***		.19*	
Attitudes	.66***		.35***		.46***	
Negative affect	−.14*	.02*	−.18*	.03*	−.15*	.02*

Dependent Variable	Experiment 2		Experiment 2		Experiment 3	
	Request for Information		Subscriptions		Request for Information	
	β	ΔR^2	β	ΔR^2	β	ΔR^2
Step 1						
Vulnerability	.34***	.12***	.43***	.19***	.29**	.08**
Step 2						
Vulnerability	.06^{ns}		.11^{ns}		.15^{ns}	
Intention	.72***	.35***	.57***	.22***	.53***	.26***

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

For the intention of respondents to participate in a stress management training and, thus, to accept the action recommendation, only a main effect of vulnerability was observed. Individuals who felt that they were at risk of suffering from stress-related illness at some future date were more willing to participate in the stress management training. The same main effect was observed on stress-related negative affect: High-vulnerability participants experienced more negative affect than low-vulnerability participants.

If we operationalize systematic processing only in terms of an impact of argument quality on persuasion, the impact of argument quality on attitudes under low vulnerability conditions is the only evidence for argument-relevant thinking. However, as inspection of the thought-listing data indicates, this conclusion would be oversimplified. "Other procedures for assessing the extent of mental effort include assessment of the number and profile of issue-relevant thoughts" (Petty & Wegener, 1999, p. 53). Thus, the fact that respondents

who felt highly vulnerable produced a greater number of thoughts than those who felt less vulnerable suggests more systematic processing under high vulnerability. This apparent contradiction can be resolved by looking at positive and negative thoughts separately. The fact that there is a main effect of vulnerability on number of positive but not negative thoughts suggests that the pattern we observe is indicative of processing that is systematic and biased. Our respondents engage in issue-relevant thinking and, as the main effect of argument quality on negative thoughts indicates, they are quite able to distinguish strong from weak arguments. However, to arrive at their preferred conclusion that the recommended action offers protection, they engage in positive thinking, and this tendency is stronger the more they perceive themselves as vulnerable.

Mediation analyses corroborate the biased processing hypothesis, revealing that the effect of vulnerability on participants' attitude toward the action recommendation was partly mediated by positive but not negative thoughts about this recommendation. The attitude, in turn, partly mediated vulnerability effects on the intention to participate in stress management training, the recommended solution. This finding is in line with social cognitive models of behavior, in which attitude is postulated to be a proximal determinant of intention (Ajzen, 1988). However, in contrast with these models, stress-related negative affect was found to add to the mediating effect of attitudes on intentions. This finding suggests that the acceptance of a recommended action can be inherently reinforcing, most likely because it may lead to a reduction of negative emotions induced by a fear appeal (Hovland et al., 1953). In conclusion, both negative emotions about the health threat and positive thoughts concerning the recommended solution to this threat (via attitudes) mediated the persuasive effects of vulnerability on intentions.

EXPERIMENT 2

To validate the findings of Experiment 1, a second study was conducted in which we strengthened the manipulation of argument quality by increasing the number of weak and of strong arguments from three to eight. Cross-cutting the vulnerability and severity manipulations taken from Experiment 1, we also added a marker condition aimed at inducing extensive processing of the action recommendation. In this condition, participants were led to believe that they would later have to defend their opinion in a group discussion. We reasoned that if the persuasion effects of high vulnerability obtained in Experiment 1 were in fact due to suboptimal levels of message processing instead of biased systematic processing, effects of argument quality on persuasion would have to be evident in the marker

condition only. Finally, the assessment of the existing dependent measures was refined and two behavioral measures were added to assess whether the vulnerability effects on intention in Experiment 1 would translate into behavior.

Method

The hypotheses were tested in a 2 (vulnerability) × 2 (severity of health consequences) × 2 (systematic processing instructions) × 2 (argument quality in the action recommendation) design. A total of 111 male and female 1st-year graduate students at the Utrecht University received Fl. 15 (8 Euro) for participating in the experiment.

INDEPENDENT VARIABLES

Vulnerability to the possible health consequences of stress was measured on the basis of a six-item 7-point scale of participants' perceived vulnerability to stress (e.g., "The probability that I will develop stress-related health problems is high"; "Due to my sensitivity to stress, I am more prone to stress-related health problems"; α = .92). Participants were divided by median split into either a low- (n = 51, M = 2.25) or a high- (n = 60, M = 4.42) vulnerability group (Mdn = 3.50). Severity (low, high) was manipulated in the same way as in Experiment 1. Argument quality (low, high) was manipulated by using either eight strong or eight weak arguments supportive of the action recommendation. Three strong and three weak arguments were copied from Experiment 1. The remaining arguments were again selected in a pilot study. In the marker condition, participants were instructed to read the action recommendation carefully because they would have to defend their opinion on this text in a group discussion later on in the experiment. In the other condition, no such instructions were given.

PROCEDURE

In the present study, all questionnaires and texts were presented on computer terminals. Other than that, the procedure that was followed was identical to the one used in Experiment 1.

MANIPULATION CHECKS

The effectiveness of the severity manipulation was assessed by three items measuring on a 7-point scale how severe, damaging, and serious the health consequences of stress were perceived to be (α = .81). Perceived argument quality of the action recommendation was assessed by three items, measuring on a 7-point scale how strong, supportive, and sensible participants rated the argu-

ments (α = .88). The effectiveness of the marker condition was assessed by three items, measuring on a 7-point scale participants' effort in understanding and thinking about the text, thoroughness in reading the text, and perceived success in recalling the text (α = .69).

DEPENDENT VARIABLES

Persuasion. Participants' attitude toward the stress management training was assessed by a semantic differential scale with six items, measuring on a 7-point scale how good, useful, reliable, important, interesting, and effective participants thought this training was (α = .87). Participants' intention to participate in a stress management training was measured by four items on a 7-point scale. Examples are as follows: "Do you intend to participate in a stress management training?" and "How likely is it that you are going to participate in a stress management training?" (α = .89). Two behavioral measures were added to assess participants' reactions toward the stress management training. Participants could directly subscribe to a stress management training (five sessions of 2 hours); this item had a "yes" or "no" option. Participants also could request more information about the training; this item also had a "yes" or "no" option.

Negative affect. Stress-related affect was assessed with a nine-item semantic differential scale. Participants had to indicate how depressed, fearful, insecure, relaxed, at ease, helpless, positive, tense, and pessimistic they felt when thinking about the consequences of stress (α = .89). Lower scores on the scale indicate more negative affect.

Processing measures. To assess the amount of cognitive processing of the action recommendation, a thought-listing task was added. Participants were instructed to enter all thoughts they had concerning the action recommendation, including their feelings and ideas about the content of the text. Two independent raters then categorized these thoughts.

Results

MANIPULATION CHECKS

A 2 (vulnerability) × 2 (severity) × 2 (argument quality) × 2 (processing instructions) analysis of variance was conducted on all manipulation checks. The ANOVA on the severity index yielded a severity main effect, $F(1, 95)$ = 12.91, p < .001. Participants in the high-severity condition rated the consequences of stress as more severe than participants in the low-severity condition (M_{high} = 5.38 vs. M_{low} = 4.73). No further effects were found. The manipulation check on extensive processing instructions revealed that participants' perceived effort and conscientiousness in reading the recommendation was greater

with systematic processing instructions ($M = 4.74$) than without systematic processing instructions ($M = 4.29$), $F(1, 95) = 4.88$, $p < .05$. No further effects were observed on this variable. The ANOVA on the manipulation check of perceived argument quality revealed that the quality of the arguments in the persuasive message was perceived as higher in the strong-arguments condition ($M_{strong} = 4.40$) than in the weak-arguments condition ($M_{weak} = 3.62$), $F(1, 95) = 10.05$, $p < .01$. Also, an interaction between severity and systematic processing instructions was found on perceived argument quality, $F(1, 95) = 6.48$, $p < .05$. No significant simple effects were observed, suggesting that overall, perceived argument quality increased with systematic processing instructions under high-severity conditions ($M = 3.73$ vs. $M = 4.26$, respectively) but decreased with similar instructions under low-severity conditions ($M = 4.36$ vs. $M = 3.69$, respectively). No further effects were found.

DEPENDENT MEASURES

Persuasion. A $2 \times 2 \times 2 \times 2$ ANOVA was conducted on participants' attitude toward stress management training, revealing two main effects. A significant main effect of perceived vulnerability was observed, $F(1, 95) = 16.49$, $p < .001$; when vulnerability was perceived as high, the attitude toward the training was more favorable ($M = 5.10$) than when perceived vulnerability was low ($M = 4.28$). Also, a main effect of argument quality was found, $F(1, 95) = 3.99$, $p < .05$, indicating that the attitude was more favorable when the recommendation contained strong arguments ($M = 4.94$) rather than weak arguments ($M = 4.51$). Although no significant interaction between vulnerability and argument quality was observed, simple effects analyses did reveal that the argument quality effect on attitudes was only significant under conditions of low vulnerability, $F(1, 108) = 4.55$, $p < .05$. Under conditions of high vulnerability, no differentiation between strong and weak arguments was observed, $F(1, 108) = 0.83$, *ns* (see Table 1, middle panel).

A $2 \times 2 \times 2 \times 2$ ANOVA on participants' intention to participate in a stress management training revealed only one significant effect, namely, a main effect of vulnerability, $F(1, 95) = 49.53$, $p < .001$. When vulnerability was high, the intention was higher ($M_{high} = 4.73$) than when vulnerability was low ($M_{low} = 2.93$). No effects of severity, instructions, or argument quality and no interactions were found.

The effects of the independent variables on the behavioral measures were tested with logistic regression analyses. A main effect of vulnerability was observed on participants' request for more information about the training, Wald(1) $= 12.58$, $p < .001$; when vulnerability

was perceived as high, participants more often requested more information on the stress management training (88.3%) than when vulnerability was low (58.8%). On participants' actual subscription to the stress management training, again a main effect of vulnerability was found, Wald(1) $= 16.86$, $p < .001$, indicating that participants more often subscribed to the training when vulnerability was perceived as high (50%) rather than low (9.8%). No further main effects or interactions were found.

Negative affect. A $2 \times 2 \times 2 \times 2$ ANOVA on stress-related affect also revealed a main effect of vulnerability, $F(1, 95) = 28.83$, $p < .001$, with high-vulnerability participants experiencing more negative affect ($M = 4.78$) than low-vulnerability participants ($M = 5.53$). Furthermore, a four-way interaction was observed between all independent variables, $F(1, 95) = 5.51$, $p < .05$. Simple effects analyses revealed that argument quality had an effect on stress-related emotions when vulnerability was low, severity was high, and no systematic processing instructions were given, $F(1, 102) = 6.43$, $p < .05$. Only in this specific condition, more negative emotions were experienced when arguments were weak ($M = 4.89$) rather than strong ($M = 6.07$). No other simple effects were observed. Considering the difficulty in interpreting this four-way interaction, this effect will not be further discussed. No other effects were found.

Processing measures. Inspection of the cognitive responses showed that participants' responses could be categorized as cognitive; no affective responses to the action recommendation were listed. Two independent judges rated the number of thoughts in each of three categories: positive (range 0-2; Kappa = .73), negative (range 0-2; Kappa = .81), and neutral thoughts (range 0-2). Because only five participants listed neutral thoughts concerning the action recommendation, this category was deleted. With respect to the total number of thoughts, a marginally significant main effect of vulnerability was observed, $F(1, 103) = 3.18$, $p = .08$; more thoughts were listed when vulnerability was high ($M = 1.24$) rather than low ($M = 0.94$). A main effect of extensive processing instructions also was observed, $F(1, 103) = 4.91$, $p < .05$, indicating more thoughts were listed with these instructions ($M = 1.28$) than without ($M = 0.90$). In addition, an interaction between vulnerability and argument quality was observed on the total number of thoughts, $F(1, 103) = 5.80$, $p < .05$. Simple effects analyses revealed that participants differentiated between strong and weak arguments only under conditions of high vulnerability, $F(1, 108) = 3.65$, $p < .05$. On the amount of positive thoughts, a main effect of vulnerability again was observed, $F(1, 103) = 12.94$, $p < .001$, indicating that

high-vulnerability participants more often listed positive thoughts ($M = 0.67$) than low-vulnerability participants ($M = 0.23$). This main effect was qualified, however, by a significant interaction between vulnerability and argument quality, $F(1, 103) = 3.77$, $p < .05$. An ANOVA was conducted to determine simple effects, revealing a differentiation between strong and weak arguments only under conditions of high vulnerability, $F(1, 108) = 4.67$, $p < .05$. No further effects were found.

With respect to negative thoughts, a marginally significant main effect of processing instructions was observed, $F(1, 103) = 3.43$, $p = .07$: When extensive processing instructions were given, more negative thoughts were listed ($M = 0.76$) than when no such instructions were given ($M = 0.53$). No further effects were found.

Mediation analyses. To assess a possible mediation of the effects of the independent variables on measures of persuasion by either negative emotions concerning the health threat or by cognitive responses to the action recommendation, regression analyses were performed on attitudes and intentions. Variables were selected as possible mediators only when the three conditions specified in Experiment 1 were met (Baron & Kenny, 1986). Positive thoughts met the criteria as a possible mediator for the effects of vulnerability and argument quality on attitudes. Negative thoughts did not meet these criteria. Negative affect met the criteria as a possible mediator for vulnerability on intentions (but not on attitudes). Similar to Experiment 1, perceived vulnerability was entered as a dummy variable (low, high).

Similar to Experiment 1, positive thoughts were found to mediate the effects of vulnerability on attitudes (see Table 2). However, unlike Experiment 1, positive thoughts ($\beta = .44$, $p < .001$) mediated the effects of argument quality on attitudes (Step 1: $\beta = .20$, $p < .01$, $\Delta R^2 = .04$, $p < .01$; Step 2: $\beta = .14$, *ns*, $\Delta R^2 = .19$, $p < .001$). Also similar to Experiment 1, the intention was predicted both by the attitude toward the action recommendation and by negative stress-related affect. Thus, similar to Experiment 1, a high vulnerability to the health risk evoked both a positive attitude about the action recommendation and negative emotions about the health risk. Both attitudes and negative affect were found to predict intentions to participate in the recommended solution. Finally, the effects of vulnerability on both behavioral measures were found to be mediated by intentions (see Table 2).

Discussion

The findings of the present study replicate and extend the results of Experiment 1. On participants' attitude, again, a main effect of vulnerability was observed. Attitudes toward stress management training were more favorable when participants felt vulnerable to stress. In addition, a main effect of the quality of the arguments in the persuasive message was observed, indicating more favorable attitudes when the recommendation was supported by strong rather than weak arguments. Contrary to the findings in Experiment 1, the severity of the consequences of stress had no effect on attitudes. Similarly, no effects of the systematic processing instructions were observed on this measure of persuasion. Thus, in the present experiment, participants' perception of the action recommendation was more favorable when it contained strong, rather than weak, arguments and when participants felt vulnerable to the health risk. Although no significant interaction between vulnerability and argument quality was observed, which given our small sample size could be due to a lack of power,[3] additional post hoc analyses did reveal that similar to Experiment 1, the quality of the arguments in the recommendation affected attitudes only under conditions of low vulnerability. When vulnerability was perceived as high, attitudes were favorable regardless of the quality of the arguments in the recommendation and regardless of the severity of the consequences of the health risk.

As in Experiment 1, the intention to participate in the stress management training was only affected by vulnerability. However, when individuals felt vulnerable, not only were they more likely to plan to participate but they also were more likely to request information about the training and, in fact, even to sign up for it. Thus, half of the high-vulnerability individuals signed up for stress management training (expected to consist of five 2-hour sessions) as compared to only 10% of the low-vulnerability individuals. Neither argument quality nor the severity of the consequences of the health risk had a direct effect on any of these measures. Similarly, the specific processing instructions had no effect on the various measures of persuasion: No main effects or interactions with argument quality were found. Finally, whereas the impact of vulnerability on behavioral intentions was only partly mediated by attitudes, the impact on actual behavior (i.e., signing up for the program) was fully mediated by behavioral intentions.

The findings in Experiment 1 also were replicated for negative emotions concerning the health threat. On stress-related negative affect, only a main effect of perceived vulnerability was observed, indicating more negative affect for high vulnerability of the health risk rather than low. As in Experiment 1, stress-related affect was one of the factors that mediated the impact of vulnerability on behavioral intention (see Table 2). This suggests anxiety reduction as one of the reasons for individuals to accept the recommendation.

With regard to the processing measures, the pattern is similar but not identical to that observed in Experiment 1. Nonetheless, all findings are consistent with the assumption that respondents who perceived themselves as not very vulnerable processed the information about the action recommendation in a systematic and unbiased manner, whereas high-vulnerability individuals processed systematically and biased. Because the observed pattern is somewhat complex, we will summarize the evidence for both depth and bias of processing. Several findings suggest that both low- and high-vulnerability participants processed the recommendation systematically: (a) Given all the indications that our systematic processing instructions were indeed successful in inducing systematic processing, the fact that there are no interactions between these instructions and vulnerability suggests a high level of systematic processing in both vulnerability conditions; (b) there was an effect of argument quality on attitudes; (c) the fact that high-vulnerability individuals produced marginally more thoughts and significantly more positive thoughts than low-vulnerability individuals suggests increased rather than decreased processing intensity; and (d) the interaction between vulnerability and argument quality on positive thoughts revealed that high-vulnerability participants differentiated between strong and weak arguments. There is also evidence of a positive processing bias for highly vulnerable respondents: (a) High-vulnerability participants had more positive thoughts—but not more negative thoughts—about the recommendation as compared to low-vulnerability participants, particularly for strong arguments; and (b) as in Experiment 1, the effects of vulnerability on attitudes were mainly mediated by positive thoughts, not negative thoughts.

In summary, then, the findings of Experiment 2 again provide support for the main hypotheses underlying our research program, namely, that arguments contained in recommendations that promise protection against some nontrivial health threat are processed systematically and that this processing reflects a positivity bias for individuals who feel highly vulnerable. Possibly, the fact that the current pattern of findings on cognitive responses slightly deviated from the one observed in Experiment 1 was caused by the adding of the marker condition in the current study. Our findings also suggest that vulnerability is an important determinant in motivating individuals to take action.

EXPERIMENT 3

In Experiments 1 and 2, the measure of vulnerability was based on participants' already existing perceptions of their personal vulnerability to stress, which leaves open the possibility that the effects of vulnerability on persuasion were in fact caused by a third—unknown—factor. To rule out this possibility, a third experiment was conducted, in which vulnerability to stress was manipulated. The marker condition was removed from the design.

Method

DESIGN AND PARTICIPANTS

The same 2 (vulnerability) × 2 (severity of health consequences) × 2 (argument quality) factor design was used as in Experiment 1. A total of 118 male and female students at the University of Utrecht participated and received a compensation of Fl. 10 (5 Euro).

PROCEDURE

All texts were presented on the computer screen and responses to the questions were typed (using Authorware). In the introduction, participants were told that a new scale had recently been developed—the Chicago Stress Vulnerability Inventory (CSVI)—to measure the risk of individuals of developing stress-related health problems in the future. Participants also were informed that research had shown that people's own perceived stress resistance was unrelated to the Stress Vulnerability Score and that their perception of their own stress resistance was not a good predictor of their future risk of developing stress-related health problems. In reality, the CSVI consisted of three scales with a total of 54 items measuring neuroticism, introversion-extraversion, and schizoid-type personality traits. Participants had to fill in the CSVI and then received false feedback on their computer screens. In the low-vulnerability condition, participants were informed that their future risk of developing stress-related illnesses was low. In the condition of high vulnerability, participants were led to believe that their future risk of developing stress-related illnesses was quite high. The manipulations of severity of consequences and argument quality were identical to the ones used in Experiment 2. After completing the questionnaires by computer, participants were carefully debriefed.

MANIPULATION CHECKS

The effectiveness of the vulnerability manipulation was assessed by having participants rate six items on their own perceived vulnerability on a 7-point scale. Examples are as follows: "The chance that I will develop stress-related health problems is high" and "Due to my sensitivity to stress I am more prone to stress-related health problems" ($\alpha = .92$). The manipulation checks of severity ($\alpha = .82$) and argument quality ($\alpha = .90$) were copied from Experiment 2.

DEPENDENT MEASURES[4]

Persuasion. All dependent measures of persuasion were copied from Experiment 2: participants' attitude

toward the recommended action ($\alpha = .82$), the intention to participate in a stress management training ($\alpha = .83$), as well as the behavioral measures of request for more information about stress management training (yes/no) and subscriptions to the training (yes/no).

Negative affect. Stress-related affect was assessed with the scale used in Experiment 2 ($\alpha = .93$). Lower scores on the scale indicate more negative affect.

Results

MANIPULATION CHECKS

To assess the effectiveness of the manipulations, 2 (vulnerability) $\times$ 2 (severity) $\times$ 2 (argument quality) factor ANOVAs were conducted on the manipulation checks for vulnerability, severity, and argument quality. The analyses revealed that all manipulations had been effective. Vulnerability was perceived as significantly higher in the high- ($M = 3.70$) than in the low-vulnerability condition ($M = 2.81$), $F(1, 110) = 17.34$, $p < .001$. The analysis of the severity index yielded a main effect of severity, $F(1, 110) = 4.87$, $p < .05$. High-severity participants rated the consequences of stress as more severe than low-severity participants ($M_{high} = 5.58$ vs. $M_{low} = 5.18$). There was also a main effect of vulnerability on this variable: High-vulnerability participants rated the consequences of stress as less severe ($M_{high} = 5.08$) than did low-vulnerability participants ($M_{low} = 5.70$), $F(1, 110) = 11.40$, $p < .005$. A main effect of argument quality was observed on the check for argument quality, $F(1, 110) = 6.96$, $p < .05$. The quality of the arguments in the persuasive message was perceived as higher in the strong-arguments condition ($M_{strong} = 4.51$) than in the weak-arguments condition ($M_{weak} = 3.86$). No further effects were observed.

DEPENDENT MEASURES

Persuasion. The 2 (vulnerability) $\times$ 2 (severity) $\times$ 2 (argument quality) ANOVA conducted on the attitude toward stress management training revealed a marginally significant interaction between vulnerability and severity, $F(1, 114) = 3.70$, $p = 06$. Simple effects analyses revealed that an increase in severity led to more positive attitudes under conditions of low vulnerability, $F(1, 115) = 4.72$, $p < .05$. This effect was not observed when vulnerability was high. No further effects were found (see Table 1, bottom panel).

A similar ANOVA on participants' intention to participate in a stress management training resulted in a main effect of vulnerability, $F(1, 110) = 9.47$, $p < .01$: When vulnerability was high, the intention was higher ($M_{high} = 4.69$) than when vulnerability was low ($M_{low} = 3.88$). No effects of severity or argument quality were found.

The effects of the independent variables on the request for more information about stress management training were tested using logistic regression. A main effect of vulnerability was found, Wald(1) = 10.98, $p < .001$: When vulnerability was high, participants more often requested additional information about the training (55.5%) than when vulnerability was low (36.7%). This effect was qualified by a significant interaction between vulnerability and severity, Wald(1) = 5.60, $p < .05$: When severity was low, the request was greater when participants felt vulnerable to the health risk (76.9%) than when they did not feel vulnerable (25%). When severity was high, no significant differences between low (46.9%) and high vulnerability (56.3%) were observed. No additional effects of argument quality were found on this measure.

On the subscription to the training, no effects of the independent variables were found. In total, there were only nine subscriptions (7.6%).

Negative affect. A 2 $\times$ 2 $\times$ 2 ANOVA on stress-related negative affect yielded a main effect for personal vulnerability, $F(1, 110) = 7.43$, $p < .01$. High-vulnerability participants reported experiencing significantly more negative affect ($M = 3.23$) than low-vulnerability participants ($M = 3.63$). No further effects were found.

Mediation. To assess a possible mediation of the effects of vulnerability on persuasion by either negative emotions concerning the health threat or by attitudes toward the action recommendation, regression analyses were performed following the three criteria specified in Experiment 1 (Baron & Kenny, 1986). These analyses revealed mediating effects for both attitudes and negative affect on participants' intentions. Furthermore, participants' intentions to participate in the recommended solution mediated the effect of vulnerability on the behavioral measure of request for information (see Table 2).

Discussion

There was a marginally significant interaction between vulnerability and severity on attitudes toward the action recommendation. Increases in severity had greater impact on attitudes under conditions of low rather than high vulnerability. Unlike in Experiments 1 and 2, argument quality did not affect attitudes despite a successful manipulation of this variable. Intention was only affected by personal vulnerability. Participants who felt at risk of suffering from stress-related illnesses were more willing to accept the recommended action. No effects of severity or argument quality were observed on this measure. These main effects of vulnerability on intention replicate the findings from Experiment 1 and 2, in which the measure of vulnerability was based on self-perception.

In line with the findings for intentions, the data on the request for information again revealed a main effect of vulnerability. Thus, under high-vulnerability conditions, participants not only were more likely to express the intention to participate in a stress management training but also were more likely to request information about the training on offer. However, on requests for information, this main effect of vulnerability was moderated by the severity of the threat. Additional analyses revealed that high-vulnerability participants requested additional information more often than low-vulnerability participants only when the consequences of the health risk were portrayed as quite mild. No differences between low- and high-vulnerability participants were observed when the consequences of the health risk were presented as quite severe. No effects of argument quality were found on behavior.

The findings on the measure of stress-related negative affect replicate the findings of Experiment 1 and 2. Only a main effect of vulnerability was observed on this measure, with high-vulnerability participants experiencing more negative emotions than low-vulnerability participants. Also similar to Experiments 1 and 2, the effect of vulnerability on participants' intention was partly mediated by both the attitude toward the recommended solution and stress-related negative emotions. Participants' intention, in turn, was the sole predictor of the behavioral measure of requests for information about the recommended solution.

Experiment 3 also provided evidence indicative of a negative bias in the processing of information about a health treat. Participants who had been informed that they were at high risk of developing stress-related problems rated the consequences of such illnesses as less alarming and less severe than participants who had been told that they were not vulnerable to stress. These findings are in line with those of Ditto and Lopez (1992), Kunda (1987), Liberman and Chaiken (1992), and Reed and Aspinwall (1998). In all of these studies, the manipulation of personal vulnerability of a health risk resulted in high-vulnerability participants reacting to the health threat with minimizing responses (Hovland et al., 1953): downgrading the importance of the threat, not believing it, or questioning the validity of the measures used. It is quite likely that a manipulation of vulnerability evokes stronger reactions than self-perceptions of vulnerability, which may explain why this minimizing response was found in the present experiment but not in Experiments 1 and 2.

GENERAL DISCUSSION

This series of studies has been conducted to test predictions derived from a stage model of the processing of fear-arousing communications. According to this model, informing individuals that they are vulnerable to a nontrivial health threat will induce biased systematic processing of an action recommendation that promises protection against the health threat. Because increasing vulnerability will increase the motivation of message recipients to perceive the recommended action as effective, perceived vulnerability to the threat also should be the major determinant of attitude and behavior change. The pattern of findings reported in this article supported this prediction. In the three studies reported here, the measures of persuasion were mainly affected by vulnerability. When participants felt vulnerable to the health risk, their intention to participate in the recommended action was greater, they more often requested information about the training, and they more often subscribed to this training. Furthermore, vulnerability was the major determinant of attitudes toward the action recommendation as well: Increases in vulnerability invariably led to more positive attitudes in each experiment. The effects of severity and argument quality on attitudes were less consistent across studies and thus prevent us from drawing any definitive conclusions about the effects of these variables on persuasion. Nonetheless, the general pattern of findings seems to suggest that if severity and argument quality had an effect on attitudes, it was observed mainly under conditions of low vulnerability.

At first glance, the absence of consistent argument quality effects on measures of persuasion for high-vulnerability participants seems to suggest that these individuals processed the recommendation heuristically. However, the cognitive response measures of Experiments 1 and 2 show that this was not the case. In both experiments, high-vulnerability participants listed more thoughts and also more positive (but not negative) thoughts about the recommended solution, suggesting increases rather than decreases in the depth of processing. In addition, high-vulnerability participants were found to differentiate between strong and weak arguments in both experiments. In Experiment 1, they listed more negative thoughts about weak rather than strong arguments. In Experiment 2, they listed more positive thoughts about strong than weak arguments. Furthermore, in both studies, only positive cognitive responses to the recommended action mediated the effects of vulnerability on attitudes toward the recommended solution. Taken together, these findings suggest that high-vulnerability participants were motivated to focus mainly on the positive aspects of the action recommendation and thus to bias their evaluation of the evidence presented in support of the recommended action.

Of interest, in all three studies, participants' negative emotions were found partly to mediate the impact of perceived vulnerability on their intentions. This added

to the effect of participants' attitude toward the recommended action, the primary predictor of intention. No such mediating effects of negative emotions were observed for the impact of vulnerability on attitudes toward the action recommendation. Thus, negative emotions evoked by perceived vulnerability to the health risk directly affected intentions to participate in the recommended solution, regardless of participants' attitudes toward the recommendation. The intention to participate in the recommended action was found to be the unique predictor of behavior, as measured by actual subscriptions to the stress management training. These findings suggest that both negative feelings concerning the health threat and positive thoughts concerning the projected solution to this threat may—indirectly—mediate the persuasive effects of vulnerability on actual behavior.

Theoretical Implications: Assessing Depth and Direction of Message Processing

Our findings demonstrate the value of including various measures of cognitive processing when assessing the processing of threatening health information. The processes underlying fear-induced persuasion were shown to be very subtle, involving attempts to minimize some parts of a fear-arousing message and maximize other parts of the same message. The differences observed in the effects of the independent variables on the various measures of cognitive processing (i.e., variations in argument quality, variations in the amount of cognitive processing, and variations in the valence of cognitive processing) make an important point: They show that, under defense motivation, indirect measures of persuasion such as the effect of the quality of the arguments in a persuasive message do not suffice for measuring either the extent or the direction of message elaboration. This is especially evident in Experiment 1, where the absence of argument quality effects under conditions of high vulnerability suggests decreases in the depth of processing, as compared to conditions of low vulnerability, whereas the cognitive processing measures provide a different and more detailed picture: an increase in the total number of thoughts and in the number of positive thoughts and a significant differentiation between strong and weak arguments. These findings validate Killeya and Johnson's (1998) argument that when a persuasive message is processed in a biased fashion, the absence of argument quality effects on measures of persuasion need not imply the absence of message elaboration. Thus, our findings suggest limits to the argument quality paradigm. They also demonstrate the benefits of adding direct measures of cognitive processing when assessing

directional biases in the processing of persuasive messages.

Theoretical Implications: Reevaluating Classical Fear Appeal Theories

Our finding that defense motivation induced a systematic positive bias in the processing of an action recommendation has implications for other theoretical conceptualization of the processing and acceptance of action recommendations following the use of fear appeals. It implies that stressing an individual's vulnerability to a health risk in a fear appeal will not induce either increased objective systematic processing, as posited by Rogers and Prentice-Dunn (1997), or a motivated acceptance of recommendations based on heuristic processing strategies, as Gleicher and Petty (1992) proposed. Instead, individuals who are vulnerable to a health risk will be motivated to focus mainly on the positive aspects of the recommendations and to bias their evaluation of the arguments in this recommendation. These findings demonstrate the importance of differentiating between vulnerability and severity of a health threat when assessing message processing and persuasion effects of a fear appeal. Most previous studies did not differentiate between vulnerability and severity within their manipulation of fear level. Thus, little information is available on the independent effects of these two variables on the processing of persuasive messages and on persuasion. However, similar to our findings, vulnerability appeared to have a more powerful effect on intention than severity in studies in which the two variables were manipulated separately to assess persuasion—but not processing—effects of both variables (e.g., Maddux & Rogers, 1983; Rogers & Mewborn, 1976). Also, as some have suggested, it may be that "severity must reach a certain magnitude to figure in health decisions, but once that magnitude has been reached decisions are solely a function of perceived susceptibility" (Sheeran & Abraham, 1996, p. 34). Consistent with this notion, in all three studies, persuasion, as well as processing measures, was mainly affected by personal vulnerability.

Our findings also may reconcile some of the inconsistencies that have been observed in fear appeal literature. As was mentioned in our introduction, the lack of reliable interaction between fear and efficacy (see Rogers & Prentice-Dunn, 1997), as well as the typically observed main effects of fear/threat on persuasion (Sutton, 1982), is inconsistent with predictions of all classical theories of fear appeals. However, in terms of our stage model, they can be accounted for by proposing that a positive processing bias may apply to efficacy expectations in the same way it applied to the quality of the argu-

ments in the experiments presented in this article. Hence, it can be argued that variations in response efficacy will be most likely to affect persuasion when an individual's vulnerability to a health risk is low because in this case, he is most likely to process recommendations systematically as well as objectively. However, an individual who feels vulnerable to a health risk will be defense motivated, resulting in positive bias in the processing of efficacy information and, consequently, in increased persuasion regardless of variations in response efficacy.

Finally, our findings suggest that fear-induced persuasion is neither strictly motivational nor strictly cognitive in nature; it is best seen as a combination of both. According to the Drive Model (Hovland et al., 1953), emotional tension is a necessary condition for fear appeals to induce persuasion. In contrast, Protection Motivation Theory (Rogers & Prentice-Dunn, 1997) explains fear-induced persuasion in strictly cognitive terms. The findings of our studies suggest that both theories are partly right and partly wrong: The impact of vulnerability on persuasion is mediated by both negative feelings concerning the health threat and positive thoughts concerning the proposed protective action. Thus, cognitions did mediate the effects of fear appeals on persuasion. However, people were not as rational as was assumed by Protection Motivation Theory because the action recommendation was not evaluated objectively but in a biased fashion. Furthermore, negative emotions about the health risk did seem to lead to persuasion in our studies. But it did not do so via the evaluation of the efficacy of the recommendation in reducing the emotional tension, as was predicted by the Drive Model. Instead, higher levels of negative affect directly increased intentions to participate in a recommended action in all three experiments. It thus seems that the emotional tension evoked by a high vulnerability to a health risk leads to some sort of action tendency, a motivation to "do something about the health risk."

NOTES

1. The findings on measures of persuasion (but not of cognitive responses and negative affect) in Experiment 1 have been described by Kuppens, De Wit, and Stroebe (1996) in the Dutch language in *Gedrag & Gezondheid.*

2. A median split procedure was used in Experiments 1 and 2 mainly for reasons of nonhomogeneity of variance on the measures of perceived vulnerability, showing a slight imbalance in the distribution of participants across conditions. The cell *n*s are reported in Table 1.

3. An article by Bobko (1986) is of interest here. It is claimed that traditional analyses of variance can produce spurious main effects and result in decreased power to detect the interaction of interest. In this article, theory-driven planned comparisons are proposed as a solution to this problem. This reasoning seems particularly applicable to the findings of Experiment 2, in which the sample size was rather small, in addition to a somewhat unbalanced distribution of participants across experimental conditions.

4. Experiment 3 does not contain cognitive responses of participants. We did include a thought-listing measure similar to Experiment 1. However, due to technical problems the thoughts listed were incomplete, rendering this measure inadequate.

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