

The action suited to the word? Use of the framework of risk information seeking to understand risk-related behaviors

Milou Kievik^a, Ellen F.J. ter Huurne^b and Jan M. Gutteling^{a*}

^a*Saxion University of Applied Sciences, Enschede, The Netherlands;* ^b*iCRiSP, University of Twente, Enschede, The Netherlands*

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Although a growing body of risk communication research focuses on how people process risk information, one question that is overlooked is how the seeking of information contributes to behavioral adaptation toward the risk issue. How are people's behavioral responses to risks affected by the search for risk information? Building on the Framework of Risk Information Seeking (FRIS), this paper reports on two studies that focus on the experimental testing of several of the basic FRIS assumptions. In study 1, a 2 (involvement: high vs. low) \times 2 (risk perception: high vs. low) between-subjects experiment was conducted to test the assumption that higher levels of involvement and risk perception stimulate the intention to seek additional risk information as well as the actual risk information. Study 2 is a partial replication of study 1. In study 2, a 2 (involvement: high vs. low) \times 2 (fear appeal: present vs. absent) \times 2 (response efficacy: high vs. low) between-subjects experiment was conducted to test how varying the levels of involvement, risk perception, and response efficacy influence actual and intended information seeking, as well as the intention to adopt risk-mitigating actions. The results showed that the high-involvement, high-risk perception, high-response efficacy group was most likely to actually seek information and make behavioral changes. The results are in accordance with basic FRIS assumptions. Implications for risk communication are discussed.

Keywords: risk communication; experiment; risk information seeking

Introduction

Information seeking has emerged as an important topic in risk communication over the past few years. The active gathering by individuals of personally relevant risk information is increasingly considered an important mediator between risk communication and subsequent risk-related knowledge and behavior (Griffin, Neuwirth, and Dunwoody 1999; Turner et al. 2006; Kahlor 2007; Ter Huurne 2008; Ter Huurne and Gutteling 2009; Ter Huurne, Griffin, and Gutteling 2009; Kievik and Gutteling in press). In this paper, we present two experimental studies that focus on the determinants of man-made risk communication, in the context of risk information seeking. The experiments aim to provide a better understanding of the role of risk perception, personal involvement, and response efficacy in risk communication.

*Email: j.m.gutteling@utwente.nl

Experimental research regarding man-made risk is scarce. However, the experimental research methodology is seen as important to increase our knowledge of the factors that influence risk communication effectiveness (see, e.g. Gutteling and Wiegman 1996; Gurabardhi, Gutteling, and Kuttuschreuter 2004 advocating this issue). Recently, several experimental studies have been published that focus on health risk decision-making (e.g. Cuite et al. 2008; Timmermans, Ockhuysen-Vermeij, and Henneman 2008; Keller and Siegrist 2009; Keller, Siegrist, and Visschers 2009). Medical or health risk communication has a long tradition in empirical and conceptual work (e.g. Rogers 1983; Witte 1992, 1998; Witte and Allen 2000; Cho and Witte 2005). This work tends to focus on the determinants of persuasion of the at-health risk audiences in laboratory setting experimental studies, stimulating the adoption of adaptive health behavior. Experimental designs in risk communication studies allow for the analysis of causal relations between predictors and behavior. In that sense experimental studies are essential in the furthering of our insight in the determinants of behavior from correlational analyses. The assumption in this study is that the theoretical concepts of health risk communication and its research methodology are applicable in preparing risk communication aimed at helping individuals to adopt self-protective behaviors with respect to man-made risks. However, to the growing body of experimental studies in (health) risk communication, there is no equivalent body of work aimed at behavioral change related to man-made risk.

Risk communication on man-made risks shares another question with medical or health risk communication. Although risk messages may prove to be effective in the research laboratory, they tend to be less effective in the public domain. Here, (health or man-made) risk information has to compete with myriad other issues and messages that call for the individual's attention. When the content of the risk message or the issue it addresses is not perceived by the individual as personally relevant or risky, the message may not be processed and recommendations will not be adopted. In this respect, it is understandable that successful 'lab-tested' messages are not always equally successful in reaching and persuading the real-world target audiences. Ultimately, persuasiveness in the public domain is not as impressive as one would have expected from the lab tests, and the preventive behavior is not adopted by many people.

Theories on risk information seeking may be better at addressing this issue and may be considered as the missing link between theory and lab research on the one hand and risk communication practice on the other hand. Risk information seeking theories focus on the risk information recipient's central position in the risk communication process. They call for an understanding of the factors that may influence the ways in which people respond to risk information and how these responses ultimately affect individuals' behavioral adaptations in the face of a specific risk. In this respect, risk information seeking is particularly noteworthy because information acquisition is an important risk coping strategy (Brashers, Goldsmith, and Hsteh 2002). Individuals may believe that if they are armed with sufficient information about a risk topic, they will be better able to make adequate decisions and implement required behavioral changes (Rimal 2001, 2008). The general public's growing interest in participating more actively in self-care decisions regarding a variety of everyday risks, combined with the rapid growth of publicly available information and heightened public information demands, underlines the importance of theoretical and empirical focus on how individuals interact with information as

they form and modify perceptions of risk (Turner et al. 2006; Kahlor 2007; Griffin et al. 2008; Ter Huurne and Gutteling 2008).

The determinants of risk information seeking

A number of scholars have begun to explore determinants of the risk information seeking strategies people employ. Theoretically, the notion of risk information seeking is rather new. To get a better understanding of the social psychological determinants of risk information seeking processes, the Framework for Risk Information Seeking (FRIS) has been developed over the last few years (Ter Huurne 2008; Ter Huurne and Gutteling 2009). Through a stepwise procedure, the theoretical development of FRIS, the development and validation of measurement instruments, model testing, and interpretation based on survey data have been reported (Ter Huurne 2008). FRIS focuses on the risk information recipient's central position in the risk communication process. Instead of just asking how messages may influence people, the current approach calls for a focus on understanding the information user's evaluative behaviors. Thus, FRIS identifies factors that may influence the ways in which people respond to risk information, and how these responses ultimately affect individuals' behavioral adaptations in the face of a specific risk. FRIS proposes that so-called risk awareness factors (risk perception, self-efficacy, and personal involvement) account for the perceived need for additional information in a risk setting (Ter Huurne 2008). These three factors play key roles in the process of risk information seeking, and given the assumption that risk information seeking precedes risk behavior adaptation or the adoption of risk preventive behaviors, they are also considered as essential for those behaviors. FRIS is theoretically founded on (social) psychological concepts; it is conceptually not confined to the boundaries of one specific risk domain (see Figure 1).

The three factors – risk perception, personal involvement, and self-efficacy – determine affective responses and information sufficiency. In combination with informational subjective norms, affective responses, and information sufficiency, they determine a person's seeking of additional risk information through various information channels or avoiding it altogether. FRIS suggests that, when risk and

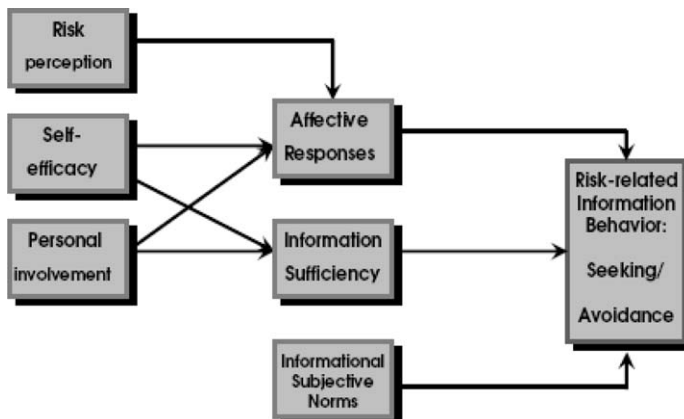


Figure 1. The Framework of Risk Information Seeking (FRIS).

efficacy are made salient, risk perception and efficacy beliefs jointly affect subsequent action. Lack of perceived efficacy is frequently noted as a factor that increases risk perceptions. With high-risk perceptions, efficacy beliefs take on added importance because the heightened levels of risk not only act as motivational factors but also tend to generate anxiety (Witte 1992). When individuals feel anxious or worried about their well-being as a result of increased risk perceptions, their perceived ability to exert personal control over the issue plays a critical role in how they behave (Witte 1992). Self-efficacy has been found to be strongly associated with both affective responses and information sufficiency, which in turn, affect the risk information seeking strategies people employ. Given recent results (Ter Huurne and Gutteling 2009), self-efficacy could be seen as a more important factor in how the audience construes risks, and successively, impacts public uptake of risk communication efforts. Since both affective responses and information sufficiency have been found to be key determinants of how people respond to information about risks (Griffin et al. 2008; Ter Huurne, Griffin, and Gutteling 2009), the influence of self-efficacy remains an important line of inquiry in this research area (McComas 2006). In addition, the level of perceived issue involvement surfaced as an important factor associated with one's intended risk information seeking behavior.

To date, the work on FRIS had been correlational and based on cross-sectional survey data (see Ter Huurne 2008). So in this study, we set out to test, in a laboratory experiment, several of the basic assumptions of this model. We focused on the factors of risk perception and personal involvement.

The risk literature comprises many studies analyzing risk perception (see e.g. Slovic 2000). Many of those studies focused on the cognitive and affective determinants of public coping with hazardous activities, situations, and technologies (see e.g. Gurabardhi, Gutteling, and Kuttschreuter 2004; Pin and Gutteling 2009 for overviews). The construct of involvement represented in FRIS refers to what Apsler and Sears (1968) termed personal or situational involvement and represents personal interest as a result of the idea that the risk issue or situation can have significant consequences to one's life (Andrews, Durvasula, and Akhter 1990; Cho and Boster 2005). In general, persons with high involvement analyze issues more often, prefer messages that contain more and better arguments (Petty and Cacioppo 1986; Heath, Liao, and Douglas 1995), and attain greater knowledge levels (Chaffee and Roser 1986; Engelberg, Flora, and Nass 1995). Involvement has been put forward as a key variable that will alter or affect the information utility one seeks to achieve by gathering additional information in a risk setting. When involvement is elicited by the perception that important future consequences are at stake, people are likely to pay attention to messages and to process them in-depth, as outcome-relevant involvement stimulates the motivation to process information and subsequent cognitive processing. Hence, outcome-relevant involvement is likely to be associated positively with information seeking, such as the motivation to stay informed about issues or products, the tendency to pay attention to mass media coverage of issues or products and the motivation to process this information. For example, research has demonstrated consistently that those who are highly involved seek information and engage in an extensive evaluation of information (e.g. Kapferer and Laurent 1985; McQuarrie and Munson 1992). They pay more attention to persuasive messages and engage in a greater level of elaboration (e.g. Celsi and Olson 1988; Perse 1990), and their information processing is more objective and less biased (e.g. Levin, Huneke, and Jasper 2000; Hubbell, Mitchell, and Gee 2001).

Study 1

The objective of this study is to show that personal involvement and risk perception can be used in an experimental setting to increase the intention for risk information seeking, as assumed by FRIS. Because the supporting evidence for FRIS to date is based on cross-sectional survey data and extensive path-analysis/Structural Equation Modeling (SEM), this study was the first attempt to apply and test the framework in an experiment.

Design

The study design was an online 2 (risk perception: high vs. low) \times 2 (involvement: high vs. low) between-subjects experiment. Potential subjects were sent an email message containing a website link guiding them to an online questionnaire, which contained all of the experimental information and questions.

Participants (University of Twente students in the Netherlands) were randomly assigned to one of four groups. At the beginning of the experiment, subjects were asked to answer some questions about their demographic background. After this, the experiment started with the reading of a fictitious newspaper article about a fire. Half of the groups read articles detailing a fire in a faculty building at the University of Twente. These messages are assumed to create a high level of involvement. An actual fire in a University of Twente building occurred in 2002. The article provided a photograph of this event to strengthen the realism of the message. The other two groups received an article describing a fire at a faculty building at Columbia University in New York, with which none of the participants had any connection. This article also contained a picture depicting the fire at Columbia. This was assumed to cause a low level of involvement.

Different amounts of arguments were used in this experiment to create different levels of risk perception (based on the work of Petty and Cacioppo 1986). Half of the subjects received articles that provided many graphic descriptions of the fire, like the intensity of the fire and the possible consequences that the fire could have for citizens, intended to create high levels of risk perception. Examples are 'During the fire, an extreme amount of dangerous substances was released,' and 'Parts of the building contained asbestos, which was released during the fire. Asbestos may cause a serious threat to the health of people living in the neighborhood, like lung cancer.' The other subjects read articles that contained none of the above descriptions. These articles were supposed to create low levels of risk perception. In both articles, the source of the information was the head of the local fire department (presumed to be a reliable source). The assumption is that reading more health risk-related arguments will have more impact on risk perception than reading only a few arguments. Table 1 summarizes the manipulations.

Table 1. Summary of manipulations in study 1.

	Low involvement	High involvement
Low-risk perception	Colombia University Few health arguments	Twente University Few health arguments
High-risk perception	Colombia University Many health arguments	Twente University Many health arguments

Participants

Ninety-two persons, aged 18–30 years, participated in the study. Significantly more females (63%) than males (37%) participated in the study ($\chi^2(1) = 6.26, p < 0.05$). Participants were all undergraduate students from Twente University.

Questionnaire

Risk perception was measured by a 14-item instrument with five-point Likert scales, indicating either disagreement (1) or agreement (5) with the statements about the severity of the risk. The first three questions measured risk perception in general. Respondents indicated how much risk they perceived was involved in a fire in general. The other 11 items measured risk perception in relation to the stimulus newspaper article. Respondents indicated how much risk they perceived was involved in the fire described in the article, how dangerous this situation was for people and the environment, and how likely it was that a fire of this extent would occur. The risk perception items formed a very reliable scale ($\alpha = 0.91$).

Involvement was measured using a four-item scale indicating either disagreement (1) or agreement (5) with statements about the levels of perceived involvement with regard to the risk topic. The scale was very reliable ($\alpha = 0.88$). Respondents were asked how relevant a fire such as those presented was for them, how interested they were in knowing about such a fire, how committed they felt about the topic and how important it was for them to obtain information regarding the possible risks that could occur.

Intention to seek information was also measured within the questionnaire, using two items. The items asked respondents whether they would seek information about the fire and whether they would notice the information provided about the fire. Also these two items were measured using statements. Respondents were asked to indicate their level of disagreement (1) or agreement (5) with these two statements. These two items correlated strongly ($r = 0.65$).

Actual information seeking behavior was measured by asking respondents to choose between four different website links. Two links were relevant to the risk described in the previously read articles, for instance www.dangeroussubstances.nl/fire. Choosing either of these links would indicate actual information seeking behavior (score: 1). The other two links were not risk relevant, for instance www.studynet.nl/studychoice, and thus did not indicate risk information seeking behavior (score: 0).

Results

There were no differences between the four conditions in age ($F(3, 90) = 0.52, p = 0.67$), gender ($F(3, 90) = 1.10, p = 0.35$), or education ($\chi^2(3) = 2.26, p = 0.52$).

The four different conditions were supposed to create different levels of involvement and risk perception. Using an ANOVA, a main effect of involvement was found ($F(1, 88) = 55.34, p < 0.01$) in the assumed direction (see Table 2), indicating that respondents in the high-involvement conditions showed higher levels of perceived involvement than respondents in the low involvement conditions. Using an ANOVA, we also found a main effect of risk perception ($F(1, 88) = 31.59, p < 0.01$), indicating that respondents in the high-risk perception conditions showed significantly higher levels of perceived risk than respondents in the opposite

Table 2. Study 1: mean scores for personal involvement (PI), risk perception (RP), the intention to seek risk information (INS), and actual information seeking (AcT) in the four conditions.

Mean scores	Low involvement		High involvement	
	Low-risk perception (<i>n</i> = 24)	High-risk perception (<i>n</i> = 22)	Low-risk perception (<i>n</i> = 23)	High-risk perception (<i>n</i> = 23)
PI	2.75	1.99	3.12	3.44
RP	2.75	3.35	2.82	3.51
INS	2.25	2.57	3.13	3.37
AcT	0.58	0.55	0.83	0.78

conditions. No interaction effect between risk perception and involvement was found. Table 2 summarizes the mean scores for the major variables in study 1 for each of the four conditions.

FRIS assumes that respondents with high levels of involvement should be more willing to seek relevant information than those with low levels of involvement. In study 1, we asked subjects to actually choose a link that enabled them to obtain further information about the risk, and we asked for their behavioral intention to seek additional risk information. The results support the FRIS assumption (Table 2). There is a main effect of involvement on actual information seeking behavior ($F(1, 88) = 20.51, p < 0.01$). In addition, we found a main effect of involvement on the intention to seek relevant risk information ($F(1, 88) = 16.00, p < 0.01$). Participants that scored high on involvement did choose a relevant link statistically significantly more often than did participants that scored low on involvement, and they also indicated that they had a higher intention to do so. The correlation between actual information seeking and the intention to seek information was 0.30 ($p < 0.01$).

FRIS also assumes that high levels of risk perception (established in the articles containing the graphic descriptions of fires) would generate high levels of information seeking behavior. However, as shown in Table 2, no mean differences were found between the high or low-risk perception conditions ($F(1, 88) = 0.13, p = 0.72$). In addition, no difference was found in the *intention of* participants to seek relevant risk information ($F(1, 88) = 1.73, p = 0.19$). These results are not consistent with the FRIS assumption.

Discussion of study 1 and implications for study 2

The results of the first study support the assumptions of the FRIS. Both the manipulations of personal involvement and risk perception were successful, and we succeeded in measuring both behavioral intention and actual information seeking behavior. Comparisons of the four experimental groups indicated that personal involvement is a good predictor of risk information seeking. It predicts both the intention to seek information and the actual risk information seeking behavior. Provided with the choice, approximately 80% of the individuals in the high personal involvement condition will take the opportunity to gather additional risk information.

However, we did not succeed in finding significant impacts of risk perception on the intention to seek risk information or the actual risk information seeking.

With respect to intention, the means of the low- and high-risk conditions differed in the predicted direction, and thus the absence of significant results herein might be due to insufficient sample sizes (a *post hoc* power analysis yielded an η^2 of 0.255, which supports our assumption regarding sample sizes. However, with regard to actual information seeking, no relation with risk perception could be found in this study. The question is, How can this be understood?

A possible explanation is that the manipulation of risk perception was not as powerful as the manipulation of personal involvement. The risk perception manipulation was inspired by the study of Petty and Cacioppo (1986), involving a varying number of risk arguments in the message. Although the manipulation in itself was successful, the overall level of risk perception was, even in the high-risk perception condition, only moderate. In order to improve the risk perception manipulation, in the replication study (#2), we decided to change two important aspects. First, we decided to use an alternative risk – terrorism – which we presumed would lead to higher levels of risk perception. Following the terrorist attacks in New York, London, and Madrid, terrorism is seen as one of the most serious and unpredictable risks in society (Beck 2002). Terrorism has a profound, multidimensional impact on society and has become a pivotal factor in the policies of governments around the world (Danieli, Brom, and Sills 2004). Terrorism therefore leads to profound feelings of unease for large groups of society (Schotzko, Richardson, and Kiragu 2006).

Second, we also applied an alternative way to manipulate risk perceptions, namely by using fear appeals. As discussed above, although the manipulation of risk perception seemed to be effective, levels of perceived risk in the high-risk perception condition seemed to be only moderate. Therefore, we also decided to use a different type of risk manipulation in order to increase perceived levels of risk. We assumed that changing both the subject of the experiment and the type of the manipulation would lead to higher levels of perceived risk among respondents.

Fear appeals are persuasive messages designed to scare or frighten people into complying with a particular message by describing the awful and terrible things that will happen to them if they do not act in accordance with the message (Witte 1992). Fear itself can best be understood as a negatively valenced emotion, accompanied by a high level of arousal that is perceived to be both significant and personally relevant and that motivates people to action (Easterling and Leventhal 1989). Although research remains inconclusive, and some research states that fear appeals do not always create higher levels of risk perception (Slater et al. 2002), other research provides proof for the assumption that fear appeals do indeed lead to higher levels of risk perception. According to Vincent and Dubinsky (2004), fear appeals create higher levels of risk perception among respondents than do messages that do not contain a fear appeal. In addition, according to a meta-analysis conducted by Witte and Allen (2000), the stronger the fear appeal, the greater the fear aroused, the greater the severity of the threat perceived, and the greater the susceptibility to the threat perceived. In study 2, we assumed that fear appeals will indeed increase the levels of risk perception.

Another explanation for the lack of coherence between actual risk information seeking and risk perception is that the persuasive messages in study 1 did not contain any content that would guide subjects on how to deal with the risk adequately. One might argue that messages that heighten the levels of risk perception without providing adequate advice about risk-mitigating solutions will not motivate the subjects to look further. They may expect to find no additional risk-mitigating

information, given that the experimenter provided incomplete information to begin with. Considering this possible argumentation, we therefore decided to provide information to stimulate the subject's response efficacy in study 2. The factor of response efficacy seems to be important in information behavior (see e.g. Witte 1992). Response efficacy can be described as the perceived effectiveness of the adaptive response in mitigation of the threat (Beirens et al. 2007). According to Griffin, Neuwirth, and Dunwoody (1999), whether or not a person will engage in information behavior depends upon their perceived information-gathering capacity. Although this concept mainly includes self-efficacy beliefs, it also states that information behavior is only likely when a person perceives that information seeking will lead to desired outcomes, which can be thought of as response efficacy. That is, when a person feels that he or she will be able to cope with a certain threat, that person will be more likely to seek relevant information than a person who does not feel that he or she can perform the appropriate actions. This is one of the arguments for FRIS to assume that self-efficacy is a key element in enhancing information seeking behavior.

However, in addition, according to Noar et al. (2006), whether or not the internet was used as a tool for finding relevant information about safer sex practices is partially dependent on the response efficacy of the respondent. Thus, whether respondents will seek for more information about a certain risk or threat depends upon the perceived efficacy of the advice that is provided to cope with the risks. Following Noar et al.'s (2006) argument, we decided to study whether high levels of response efficacy enhance risk information seeking.

Study 2

Research questions

The aim of study 2 is three-fold. First, we tried to replicate study 1, by manipulating levels of personal involvement and perceived risk, in order to show that personal involvement and risk perception can be used in an experimental setting to increase the intention for risk information seeking as assumed by FRIS. A different risk topic and manipulation was used in order to improve the risk manipulation and corresponding results. The second question that was addressed in study 2 is, What is the relation between risk information seeking and the intention to take preventive or risk-mitigating behavior? Since the seeking of relevant risk information is only effective when this seeking of information leads to the adoption of preventive or risk-mitigating behavior, it seems of interest to explore the relationship between these two variables. Assumptions are that high levels of risk information seeking leads to higher levels of preventive or risk-mitigating behavior among respondents. The third established research question asks, What is the impact of messages conveying high or low on risk perception, involvement, and response efficacy on the intention to take preventive or risk-mitigating behavior? FRIS assumes that high levels of risk perception, involvement and efficacy would lead to high levels of risk information seeking, which in turn is assumed to lead higher levels of preventive or risk-mitigating behavior, assumptions are that high levels of risk perception, involvement and response efficacy also lead to high levels of preventive or risk-mitigating behavior.

Design

The study was a 2 (risk perception – fear appeal: high vs. low) \times 2 (involvement: high vs. low) \times 2 (response efficacy: high vs. low) between-subjects experiment,

adding to study 1 the manipulation of response efficacy. Undergraduate students from the University of Twente were sent an email message containing a website link that gave them access to the study. Participants were told that they would participate in a study analyzing written texts (INTACT). Thereafter, participants were asked to describe how they felt about the subject of 'terrorism.' After answering this question, the computer displayed a message stating that the program INTACT would generate advice based on the given answer. After 10 seconds, all respondents were given feedback about their interest in the topic of terrorism and their ability to cope with the possible dangers (Rimal 2001). Without actually calculating a score, randomly half of the participants received feedback that consisted of the manipulation of high-risk perception, high personal involvement, and high response efficacy. The other half of the participants received feedback that was assumed to indicate low-risk perception, low personal involvement, and low response efficacy. All manipulations were tested extensively for their efficacy in a separate pilot experiment, and proved to be successful. The high involvement message explained the subjects they were in the top 10% with regard to interest in terrorism issues. The low involvement message told the subjects they belonged to the bottom 10%. The high-response efficacy message contained several examples of actions that could be undertaken to minimize the possibility of a terrorist attack. The low response efficacy group was told that not many things could be done. After reading this advice, the computer program asked respondents to move on to the next screen, on which participants were told that they were about to see the front page of a newspaper. They were asked to read this front page in its entirety. In doing so, they were confronted with the manipulation of risk perception. The high-risk perception group was given a high fear arousing picture. The low-risk perception group received a neutral picture.

Both front pages consisted of four different newspaper articles. The first article was the target article, titled 'The Netherlands against terrorism,' and gave information about terrorism and the safety measures that can be taken. Three other articles were unrelated to the topic of terrorism.

After reading the front page, respondents were asked to indicate which article they would like to read in its entirety by choosing one of the four articles. We assumed that their choice would indicate their actual risk information seeking behavior. Subsequently, participants were asked to complete a questionnaire. Table 3 summarizes the eight experimental conditions.

Participants

A total of 168 undergraduate students from Twente University (aged 18–33 years) participated in the study. The distribution of respondents among the conditions varied between 20 and 26. Slightly more females (54%) than males (46%) participated in the study ($\chi^2(1) = 1.17, p < 0.05$).

Measures

All questions were based on previous studies (Ter Huurne 2008). All questions were measured on a five-point Likert-type scale, with extremes from *strongly disagree* (1) to *strongly agree* (5), unless stated otherwise.

Table 3. Experimental manipulations in study 2.

	Low response efficacy	High response efficacy
<i>Low involvement</i>		
Low fear appeal	Bottom 10% of population involvement Not possible to ward off the threat Message containing no fear appeal	Bottom 10% population involvement Possible to ward off the threat Message containing no fear appeal
High-fear appeal	Bottom 10% of population involvement Not possible to ward off the threat Message containing fear appeal	Bottom 10% population involvement Possible to ward off the threat Message containing fear appeal
<i>High involvement</i>		
Low fear appeal	Top 10% of population involvement Not possible to ward off the threat Message containing no fear appeal	Top 10% of population involvement Possible to ward off the threat Message containing no fear appeal
High-fear appeal	Top 10% population involvement Not possible to ward off the threat Message containing fear appeal	Top 10% of population involvement Possible to ward off the threat Message containing fear appeal

Risk perception was measured using a reliable 14-item scale ($\alpha = 0.95$). Respondents were asked to indicate how severe and risky terrorism is, and how high they think the chance is that a terrorist attack will happen in the Netherlands. Other questions related to the level of personal risk for the subjects, how severe the consequences are for them, how dangerous terrorism is for them, and how likely it is that a terrorist attack will occur in their environment.

Involvement. Levels of involvements were measured using a four-item scale, which resulted in a reliable scale ($\alpha = 0.89$). The items measured the amount of interest respondents had in terrorism, the influence it had on their lives, their involvement in terrorism, and the amount of information a person would want to obtain about a possible attack.

Intention to seek risk information. The intention to seek risk information was measured using a two-item scale. These items correlated strongly ($r = 0.65$). The items asked respondents whether they would seek information about terrorism and whether they would pay attention to information provided about terrorism.

Actual risk information seeking behavior. To measure the information seeking behavior among respondents, respondents were asked, after reading the front page of the newspaper, to indicate which of the four articles they would like to read in detail. One of the presented articles actually reported about terrorism, and thus it was relevant in relation to the topic (score: 1). The others were not relevant to the topic (score: 0).

Response efficacy. The amount of response efficacy respondents experienced was measured using seven items. This scale seemed reliable ($\alpha = 0.84$). The questions in the questionnaire with regard to response efficacy assessed whether respondents felt they could do something against terrorism, whether they thought the government does something against terrorism and the effect of seeking information about terrorism with regard to anti-terrorism measures.

Table 4. Study 2: mean scores for the intention to seek risk information (INS), actual information seeking (AcT), and the intention to adopt behavioral change (ABC) with low or high fear appeal, low or high involvement, and low or high response efficacy.

Fear appeal involvement	Low				High			
	Low		High		Low		High	
	Low	High	Low	High	Low	High	Low	High
INS	2.60	2.20	2.80	3.35	2.63	3.23	2.62	4.03**
AcT	0.95 [#]	0.20	0.35	0.75	0.30	0.27	0.76	1.00**
ABC	2.21 [#]	2.52	2.45	2.52	2.72	3.58**	3.13**	3.75**

**Indicates significantly higher than in other conditions at $p < 0.01$.

[#]Indicates significantly lower than in other conditions at $p < 0.01$.

Intention to adopt risk-mitigating behavior. The intention for risk-mitigating behavior was measured using three reliable items ($\alpha = 0.86$). Respondents were asked how likely they were to take precautionary measures, whether they would adhere to recommendations given, and whether they would adhere to given instructions.

Results

No differences between the eight conditions for gender ($F(7, 160) = 0.15, p = 0.99$), age ($F(7, 160) = 0.96, p = 0.47$) or education ($\chi^2(7) = 4.75, p = 0.69$) were found. The manipulation check revealed main effects for risk perception, response efficacy, and involvement, all in the predicted direction (risk perception $F(1, 160) = 111.05, p < 0.01$; response efficacy $F(1, 160) = 20.26, p < 0.01$, and involvement $F(1, 160) = 5.03, p < 0.05$, respectively). As can be concluded, all manipulations in this experiment were successful.

Table 4 summarizes the mean scores for the dependent variables in study 2 by condition.

Replicating study 1 and testing study 2 research questions on information seeking

For the replication of study 1, using ANOVA, the effect of the independent variables on risk perception and involvement in actual and intended information seeking behavior was analyzed. As shown in Table 4, a main effect of risk perception ($F(1, 164) = 8.30, p < 0.01$) and involvement ($F(1, 164) = 55.06, p < 0.01$) on actual information seeking behavior was found.

In addition, main effects of risk perception ($F(1, 164) = 7.52, p < 0.01$) and involvement ($F(1, 164) = 12.08, p < 0.01$) were found for the intention to seek risk information. All differences were in the assumed direction. Analysis of the correlations revealed a moderate correlation between actual and intended risk information seeking ($r = 0.35$). The correlation between the intention to take adopt risk-mitigating behavior and actual information seeking ($r = 0.26$) and the intention to seek information ($r = 0.42$) were low to moderate. The correlations do, however, support the assumption that information seeking coincides with a higher level of intention

to adopt behavioral change. Therefore, these results support the basic assumption of FRIS that risk perception and personal involvement have an impact on (actual and intended) risk information seeking and that risk information seeking coincides with a higher intention to adopt risk-mitigating behavioral measures.

The impact of risk perception, involvement, and response efficacy on the intention to adopt risk-mitigation behavior

Using ANOVA, the effect of risk perception, involvement, and response efficacy on the intention to take risk-mitigating behavioral measures was tested. Main effects of risk perception ($F(1, 160) = 22.70, p < 0.01$), involvement ($F(1, 160) = 12.25, p < 0.01$), and response efficacy ($F(1, 160) = 3.01, p < 0.1$) on the intention to adopt risk-mitigating behavior were found. All differences are in the predicted direction, indicating that subjects who received messages with high levels of risk perception, involvement, or response efficacy had a higher intention to adopt behavioral change. Furthermore, the three-way interaction between risk perception, involvement, and response efficacy on the intention to adopt risk-mitigating behavior was significant ($F(1, 160) = 4.07, p < 0.05$), as can be seen in Figure 2. The interaction indicated that under the high-risk perception and high-involvement condition, significantly more intention to adopt risk-mitigating behavior was generated by a high-response efficacious message than by a low efficacious message ($t(39) = 2.64, p < .01$). In the high-risk perception and low involvement condition, and in both low-risk perception conditions, no significant differences in behavioral intention were observed (all t -tests yielded non-significant results).

Overall discussion and conclusions

The purpose of these experiments was two-fold. First, we set out to test, in a laboratory experiment, several of the basic assumptions of the FRIS. To date, the work on FRIS had been correlational and based on cross-sectional survey data (see Ter

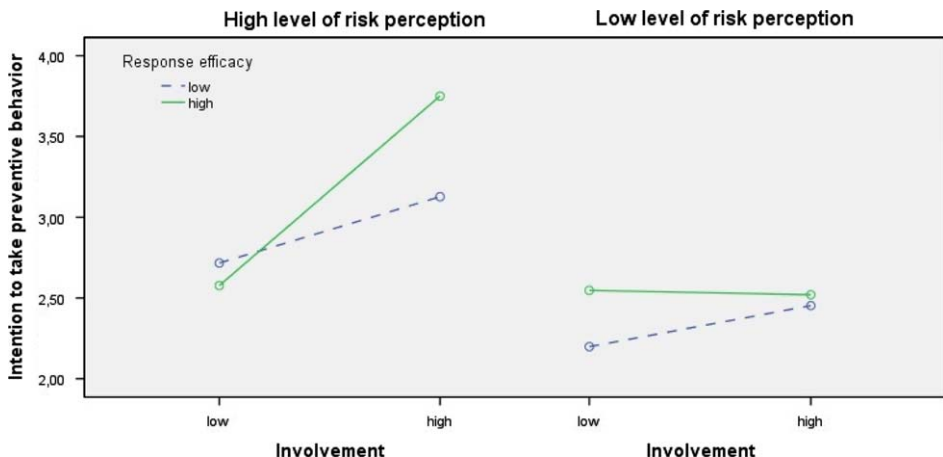


Figure 2. The three-way interaction between risk perception, involvement, and response efficacy. (Scale: 1 = no behavioral change, 5 = high levels of behavioral change.)

Huurne 2008). The experiments indicated that risk perception and personal involvement, as FRIS predicts, have an impact on risk information seeking. That is, when people perceive risks to be higher and perceive the risk as more personally relevant, their intention to seek (additional) risk information is higher as well. Although FRIS assumes that the relationship between risk perception and involvement is mediated by affective responses, information sufficiency, and informational subjective norms (Figure 1), we did look for a direct relationship. We feel it is important here to mention that this study is the first experimental study regarding this Framework, in which we had to establish a solid experimental procedure and valid and reliable measuring instruments. For this reason, we decided to focus on two of the core concepts of the Framework. Future studies may involve analyzing direct vs. indirect effects on risk information seeking. Other studies will focus on manipulating affective reactions, information sufficiency, and informational subjective norms to enhance levels of risk information seeking. The importance of this step-by-step approach is underlined by the finding that, although we were able to demonstrate that risk perception and personal involvement actually do lead to people making an effort to obtain more information, we found this in study 2 but not in study 1. After study 1, we assumed that the risk object that subjects were informed about (a fire in a university building with hazardous materials released [study 1] vs. the threat of terrorism [study 2]), and in the absence (study 1) or presence (study 2) of response-efficacious information, could be responsible for this. In study 2, we also applied a risk perception manipulation (fear appeal) that we assumed was stronger than the one applied in study 1 (multiple arguments). As study 2 yielded results as expected, we conclude that the original FRIS assumption was supported. Additional work, however, is needed to determine whether the factors (the risk itself, the manipulation of risk perception or the framing of response efficacy) make the difference in the level of actual information seeking. We interpret the findings as a first, but important, step in further empirical support for the FRIS. Because both studies also showed positive, but moderate, correlations between actual information seeking and the intention to adopt risk-mitigating behavior, these studies are an indication of the potential for the concept of risk information seeking to provide a better understanding of risk communication effectiveness. We note here that actual information seeking was measured with a single dichotomy, which may have resulted in an underestimation of the relationship between actual information seeking and the intention to seek information. Additional work on the measure of actual information seeking is needed. It also needs mentioning that finding direct relations between risk perception, personal involvement, and information seeking does not mean that the basic assumption of FRIS is refuted, we simply did not look at mediating effects to keep the study design in this first phase relatively simple.

The second goal of the study was to test the impact of different stimuli – messages that convey a low- or high-risk perception, low or high involvement, and low or high response efficacy – on the intention to adopt risk-mitigating behavior. The results showed that a message lacking fear appeal (and thus with low-risk perception), in combination with low levels of involvement and response efficacy, leads to the least information seeking behavior. Therefore, the respondents who read the message without a fear appeal, who were uninvolved and did not know how to cope with the communicated risk, chose less often than subjects in the other conditions to seek additional risk-relevant information. However, this was not the case for intended information seeking behavior. The lowest intention to seek relevant

information was found among respondents who read a message without fear appeal and were uninvolved but who assessed the message as response-efficacious. Thus, high levels of response efficacy do not necessarily lead to high levels of information seeking behavior. As experiment 2 indicated, this was only observed when the risk perception was high and when personal involvement was high.

That a message containing a fear appeal, together with high levels of involvement and response efficacy, leads to the highest intention to adopt behavioral change is in accordance with the Protection Motivation Theory (PMT) (Rogers 1983). That is, respondents who experience high levels of risk perception, are highly aware of terrorism and feel that the message helps to cope with the threat, show more intention to change their risk-mitigating behavior than respondents who experience low levels of risk perception, involvement or efficacy. In addition, respondents who read the low-fear message and who experienced low levels of involvement and response efficacy, showed the least behavioral change. That is, respondents who experienced low levels of risk perception – who were not aware of terrorism and felt that they were not able to cope with this threat – showed less behavioral change than respondents who experienced high levels of these elements. This can be seen as an indication that the concepts and methodologies used in health risk communication work (like PMT and others) and may be applicable in studying processes of behavioral adaptation in the domain of man-made risks.

In conclusion, one can state that messages that convey a high level of fear are indeed effective in enhancing information seeking behavior and behavioral change. Respondents who read a high-fear message showed higher levels of information seeking and behavioral change than did respondents who read the low-fear front page. However, this phenomenon only occurred when the high-fear message was accompanied by either involvement or response efficacy. Thus, a fear appeal on its own does not enhance risk-reducing behaviors. Furthermore, high levels of response efficacy and involvement were effective in enhancing information seeking behavior and behavioral change. Therefore, the results of this study indicate that the best combination in enhancing information seeking behavior and behavioral change would be to use a message that contains a fear appeal among respondents highly involved within the risk topic and to provide examples of how an individual can cope with the risk described.

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