

Yes, we can: Motivating Dutch citizens to engage in self-protective behaviors with regard to flood risks

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Abstract

Although the risk of flooding poses a serious threat to the Dutch public, citizens are not inclined to engage in self-protective behaviors. Current risk communication tries to enhance self-protective behaviors among citizens, but is not successful. The proportion of citizens engaging in self-protective actions remains rather low. Therefore, this research focused on the determinants of self-protection regarding floods.

The study was a 2 (risk perception: high vs low) x 2 (efficacy beliefs: high vs low) between-subjects experiment. It tested how varying levels of risk perception and efficacy beliefs influenced risk information seeking behavior and the intention to engage in self-protective behavior. Results showed that, compared to low levels of risk perception, high levels of risk perception led to higher levels of individuals seeking information regarding risk with the intention to engage in self-protective behavior. The same trend occurred regarding efficacy beliefs. Seeking information regarding risk acts as a mediator between the levels of perceived risk on the one hand and efficacy and the intention to take self-protective actions on the other. Implications for flood risk communication are discussed.

Key words: Information seeking behavior, Self-protective behaviors, Risk perception, Efficacy beliefs, Flood risks

1. Introduction

Flood risks pose a common threat to many heavily populated coastal areas around the world (Maaskant et al. 2009). The Netherlands is situated in a delta area, mainly below sea level, bordered by the North Sea, with several major European rivers flowing through the country. In terms of the severity of the consequences, floods can be seen as the most serious natural hazard for the country. Although many high-quality precautionary measures are being taken to prevent flooding, which actually is a low-probability risk, no certainty exists about whether flooding may occur in the future when climatic conditions change (Ministry of Transport, Public Works and Water Management 2006).

Influenced by European rules and regulations, and considering the catastrophic events in New Orleans after the hurricane Katrina as a warning sign, the Dutch government is redefining its role in preventing and mitigating calamities like disastrous flooding. In this process, notions about the roles and responsibilities of individual citizens in engaging in risk-preparation activities also change. The government is aware that it cannot give Dutch citizens a 100% calamity protection guarantee. The protection of the public is best served by encouraging additional self-protective measures and resilience (de Wit et al. 2008). Citizens are expected to pro-actively prepare themselves for flood risks to increase their personal safety (Grothmann and Reusswig 2006). These prevention actions undertaken by citizens may also considerably reduce the economic damages of floods (Fink et al. 1996).

To motivate citizens to adopt protective behaviors, different governmental campaigns have been established in the Netherlands, like the 'denk vooruit' (think ahead) campaign (www.crisis.nl). Information regarding such risks can be reached via municipal and provincial websites and can easily be linked to a specific residence by entering a postal code. The question is whether this campaign sufficiently motivates people to prepare for the risk of flooding. Several studies have shown that relatively few people educate themselves by visiting the 'think ahead' website, only few people report taking self-protective measures with regard to flooding, and the perception of risk with regard to flooding in the Netherlands is generally low (Terpstra 2010; Gutteling et al. 2010). The lack of motivation to prepare for floods is not only observed in the Netherlands. Research in other European countries like Germany, Norway, Sweden and the United Kingdom indicates that over 80% of all respondents had not undertaken activities to mitigate future losses or to prepare for flood emergencies (Krasovskaia 2005). Additional research conducted by Terpstra and Gutteling (2008) in different regions in the Netherlands has pointed out that few citizens engage in self-protective behaviors with regard to flood risks. Individuals do not take precautionary actions, nor do they show signs of adaptive behaviors with regard to flood risks. These results seem surprising as flood risks do pose a serious threat to the Dutch population and the government does strive to promote self-protective actions through campaigns.

2 Theory and Hypotheses

This study seeks to determine how flood risk information can motivate individuals to adopt self-protective behaviors. In this paper, we take the position that the failure to adopt self-protective measures in the case of flood preparedness is due to at least two interconnected conditions. The first condition is that, as studies indicate, Dutch people do not seek flood risk information, and thus they have no exposure to such information; without exposure, no effect is to be expected. As a result, researchers have studied the reasons why one may seek information regarding flood risk (Kahlor 2007; Ter Huurne and Gutteling 2008). This research could support the signaled policy change which aims at motivating individual citizens to take more responsibility for flood risk preparation. Increased awareness of individual responsibility of citizens could become manifest in a more active risk information seeking role of the citizen. This approach implies a focus on mass mediated information. Given the urgency of the issue and the size of the targeted audience (>10 million people), other risk communication approaches seem less useful at the moment.

The second condition is that existing flood risk information may not be effective in promoting self-protective behavior. There is no empirical evidence concerning the efficacy of information regarding flood risk information. Also, the information is not based on risk communication theory or best practices. Research should be conducted to explore how the determinants of risk information seeking behavior be applied to make information more effective in stimulating the adoption of self-protective measures.

Information seeking behavior

Information seeking has emerged as an important topic within the risk communication sector over the past few years and can be described as a deliberate effort to acquire information in response to a need or gap in one's knowledge (Griffin et al. 1999; 2008; Case et al. 2005). Campaigns are often established under the assumption that all residents are susceptible to certain risks and threats faced by society, and citizens will seek available information regarding different risk topics (Sjoberg 2002). However, citizen information seeking behavior is not as straightforward as this description. Individuals do not always seek relevant risk information or they may even avoid information (Miller 1987). This calls for an understanding of the factors that may influence the ways in which people respond to risk information and determine whether to follow the advice.

The Framework for Risk Information Seeking (FRIS) (ter Huurne 2008; Kievik et al. 2009) focuses explicitly on why individuals seek information regarding risk and safety. It proposes that three awareness factors may account for the perceived need for additional information in a risk setting. These factors are as follows: the perceived level of risk, personal involvement and self-efficacy. Furthermore, FRIS states that when risk and efficacy beliefs are made salient, risk perception and efficacy beliefs jointly affect subsequent action. Thus, the level of perceived risk and efficacy may be crucial factors in facilitating the information seeking process. Since observed values of risk perception indicate that flood risks seem to be of little importance to the Dutch (e.g., Terpstra and Gutteling 2008; Grothmann and Reusswig 2006), FRIS predicts a low-level of information seeking behavior among citizens, thus, creating unfavorable conditions for effective risk communication.

The intention to take risk-mitigating or self-protective actions

Research contributed to our understanding of why Dutch citizens do not engage in flood risk self-protective actions (e.g., Terpstra and Gutteling 2008). First, the level of risk perception that citizens experience with regard to flood risks is low. As perceptions of moderate to high levels of risk are seen as necessary conditions for individuals to take action, because the interest in flood risk is low, the lack of interest in flood risk may be one explanation for the lack of motivation to take precautionary measures among residents (Miceli et al. 2007). Second, citizens of areas prone to flooding seem to have low levels of both self-efficacy and response efficacy. This finding indicates that citizens do not know whether they are capable of executing actions that may reduce their vulnerability to flood risks (low level of self-efficacy), and citizens are uncertain that advised actions by the government would be effective in mitigating the threat (low level of response efficacy) (Grothmann and Reusswig 2006). Research indicates, however, that for an individual to take precautionary measures, certain levels of self-efficacy and response efficacy are required (Rimal and Real 2003). The combination of elevated levels of risk perception, self-efficacy and response efficacy may motivate people to adopt self-protective measures (Witte 1992; Smith et al. 2007).

One way to increase risk perception would be the use of “fear appeal messages” (Witte and Allen 2000; Kievik et al. 2009). Fear appeal has several characteristics which can lead to three different outcomes. (Witte 1992). First, individuals appraise the threat of an issue. The more individuals believe they are susceptible to a serious threat, the more motivated they are to evaluate

the efficacy of the recommended response. If the threat is perceived as irrelevant or insignificant, then there is no motivation to further process the message, and people will simply ignore the fear appeal. In contrast, when a threat is believed to be serious and relevant, individuals may become motivated to take action to reduce the induced level of fear (Witte and Allen 2000).

Perceived efficacy (composed of self-efficacy and response efficacy) determines whether people will become motivated to control the danger or to control their fear about the threat. When people believe they are able to respond appropriately against the threat (i.e., the advice is related to high self-efficacy and/or response efficacy), they are motivated to control the danger and consciously think about ways to remove or lessen the threat. Under these conditions, people carefully think about the recommended responses advocated for in the persuasive messages about risk and adopt those as a means to control the danger. Alternatively, when people are uncertain about the effectiveness of recommended actions (i.e., the advice related to low self-efficacy and/or response efficacy), they are motivated to control their fear through denial, defensive avoidance or reactance (Witte and Allen 2000).

Thus, the risk communication literature suggests that perceived threats contribute to the one's response to a risk, whereas perceived efficacy (or lack thereof) contributes to the adaptive or maladaptive nature of the response. If no information with regard to the efficacy of the recommended response is provided, individuals will rely on past experiences and prior beliefs to determine perceived efficacy (Zaalberg e.a. 2010). Thus, it seems that for residents to engage in self-protective behaviors, two conditions must be met. First, the level of aroused fear must be high. According to 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. Second, the level of perceived efficacy should be high as well. Not only is the 'fear message' of importance, but also the efficacy message that is attached to the fear message is important. When conditions are met, it is more likely that self-protective behavior will be the result. Only when both levels of risk and efficacy are high will individuals seek relevant information and take precautionary measures to protect themselves against risks like flooding (Witte and Allen 2000).

Hypotheses

The aim of the current study was to determine the effect of levels of risk perception and efficacy beliefs on actual and intended risk information seeking by individuals and one's intention to engage in self-protective behaviors regarding flooding risk. With regard to information seeking behavior, the following hypotheses were formulated.

H1a: Compared to low levels of risk perception, high levels of risk perception lead to higher levels of both actual and intended information seeking behavior.

H1b: Compared to low levels of efficacy beliefs, high levels of efficacy beliefs lead to higher levels of both actual and intended information seeking behavior.

With regard to one's intention to take self-protective action, two hypotheses were established.

H2a: Compared to low levels of risk perception, high levels of risk perception lead to higher levels of intention to engage in self-protective behaviors.

H2b: Compared to low levels of risk perception, high levels of efficacy beliefs lead to higher levels of intention to engage in self-protective behaviors.

Furthermore, we aimed to understand how the seeking of information contributes to the adoption of risk-mitigating and self-protective behaviors. Because the assumption is that the same factors that predict the information seeking process derived from FRIS (risk perception and efficacy beliefs) underlie the intention of citizens to engage in protective actions, we hypothesized that information seeking predicts the intention to adopt self-protective measures.

H3: Compared to low levels of information seeking behavior, high levels of both actual and intended information seeking behavior lead to higher levels of intention to engage in risk-mitigating preventive behaviors.

Finally, we wanted to test whether information-seeking behavior is a mediator (see Baron & Kenny, 1986 p.1176) between the independent variables, risk perception and efficacy beliefs, and the dependent variable, which is one's intention to engage in risk-mitigating or self-protective behaviors (figure 1).

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Because the aim of governmental campaigns is to enhance self-protection among citizens (Grothmann and Reusswig 2006), and the assumption is that the seeking of information is an essential link

between the risk campaign and individual risk information processing (Griffin et al. 1999), information-seeking was assumed to mediate the relationship between the provided stimuli and behavior. The study investigated whether one's seeking of risk information indeed has added importance compared to providing risk stimuli alone. Therefore, the final hypothesis was:

H4: Information-seeking behavior acts as a mediator between the independent variables risk perception and efficacy beliefs on the one hand and the intention of respondents to take risk-mitigating or self-protective actions on the other.

3 Method

Design and procedure

The study was a 2 (risk perception: high vs low) x 2 (efficacy: high vs low) between-subjects experiment. Between September 2009 and October 2009, randomly chosen inhabitants of various low-lying parts of the Netherlands were invited by letter to participate in the study. Participants were randomly assigned to one of four groups (Table 1); their groups were assigned based on which of four invitation letters they received. These letters contained a website link, giving respondents access to the corresponding online questionnaire.

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After completing the questionnaire, participants were told that they would be participating in a study exploring the thoughts and feelings of citizens with regard to flood risks.

Manipulation of risk perception. Two successive manipulations were used to vary the level of risk perception among respondents. At first, after respondents successfully found the online survey, they were asked to answer a few personal questions. They were told that these questions served to assess the degree to which they were vulnerable to flood risks. After answering these questions, respondents were told that the computer processed the information and that they had to wait for a few seconds. Hereafter, respondents received the information about their personal risk of flooding in the future, based on their given answer. We employed a procedure similar to Rimal (2001) to manipulate risk perception and also efficacy, as will be discussed later. Without actually calculating a score, randomly half of the participants received feedback that their personal risk in case of a flood was high, whereas

the other half of the respondents were told that their personal risk in case of a flood was low, regardless of their answers to the personal questions.

Respondents in the high-risk group were given the following message:

“Based on the information you provided, the chance that a future flood will have negative consequences for you – “is in the top 10 % of the population living in an area prone to flooding.” This means that you are vulnerable when a flood will occur. While this assessment is not 100% accurate, it is highly reliable. Possibly you’re not worried about the possibility of a flood in the future, but did you know that the chance of flooding in the Netherlands is fairly high!”

Respondents in the low risk group were given the following message:

“Based on the information you provided, the chance that a future flood will have negative consequences for you – “is in the bottom 10% of the population living in an area prone to flooding.” This means that you are not vulnerable when a flood will occur. While this assessment is not 100% accurate, it is highly reliable. Possibly, you didn’t worry about the possibility of a flood in the future, and this is legitimate. The chance of flooding in the Netherlands is fairly small!”

After respondents read this message, risk perception was also manipulated using fear appeals. After respondents had received their “personal risk message”, they were asked to read a newspaper article about flood risks in the Netherlands and the ways in which citizens can prepare themselves for a possible flood in the future. The newspaper article was accompanied by a picture; half of the participants received the newspaper article accompanied by a fear appeal picture, whereas the other half received the same article to which a more neutral picture was added (Appendix 1).

Manipulation of efficacy. The newspaper article discussed in detail the precautionary measures the government takes against flooding and the ways in which citizens can prepare themselves for a possible flood in the future. Two different newspaper articles were written. Half of the respondents read the article that was established on the current campaign against flood risks (the ‘denk vooruit’ campaign) and was supposed to create lower levels of both self-efficacy and response efficacy. The other half read an article that was in principle the same as the first article, but several aspects were added to increase the perceived levels of self-efficacy and response efficacy.

Participants

A total of 726 respondents between 18 and 85 years of age participated in the study. Responses were collected in two different trials. The first trial included 160 participants and functioned as a pilot test to find support for the different manipulations. The second wave included the remaining 566 participants and took place one month later. Because no significant differences in the dependent variable were found between the two trials, the results were based on the total group of participants. Conditions had between 156 and 238 participants. Slightly more males (59%) than females (41%) participated in the study ($\chi^2 (1) = 24.00, p < 0.01$).

Measures

After respondents finished reading the articles, they were asked to complete a questionnaire measuring the variables described below. The questionnaire was based on a previously validated questionnaire (Ter Huurne 2008). This questionnaire, unless otherwise stated, measured responses on five-point Likert-type scales, with extremes *strongly disagree* (1) to *strongly agree* (5).

Actual information seeking behavior. To measure the information seeking behavior among respondents, respondents were asked, after reading the newspaper article, to choose between one of four website links with an informative name. Two of these links were relevant to the topic of flood risks, like a link redirecting to the 'think ahead' campaign (www.denkvooruit.nl/noodpakket), scoring 1. The other two website links were irrelevant to the topic, like a link redirecting to a webpage with regard to holiday destinations (www.vakantiebestemmingen.nl/malediven), scoring 0. Respondents choosing the website links with the topic of flood risks showed relevant information seeking behavior, whereas respondents choosing one of the other website links did not.

Intention to seek information. Levels of intention to seek relevant risk information were measured using a three-item scale. Respondents were asked to indicate how likely they were to seek information about flood risk in the future and to keep track of relevant risk information. This scale had high reliability ($\alpha=0.89$).

Intention to take precautionary measures. The motivation of respondents to take preventive actions was measured using an eight-item scale. Respondents were asked how likely they were to

take preparation and precautionary measures and adhere to given instructions. This scale had high reliability ($\alpha=0.94$).

Risk perception. Risk perception was measured using a 17-item scale. Respondents were asked to indicate how severe and dangerous flood risks are, how high the chance is that a flood will occur in the Netherlands in the future, and how much damage a flood will cause for citizens living in the affected area. Also, the participants had to indicate how dangerous they felt flood risks are for them personally and how likely they felt it would be that a future flood would cause problems for them personally. Also, this scale yielded reliable results ($\alpha=0.94$).

Self-efficacy. Level of self-efficacy was measured using a reliable nine-item scale ($\alpha=0.96$). Respondents were asked to indicate to what extent they thought they could prepare themselves for the possibility of a flood in the future.

Response efficacy. Response efficacy was measured using a reliable ten-item scale ($\alpha=0.95$), measuring the extent to which respondents thought that different preparation and precautionary measures were effective in protecting oneself from negative consequences of a possible flood in the future.

Efficacy scale. The analysis with regard to efficacy beliefs was conducted based on the combination of levels of self-efficacy and response efficacy. The combined nineteen-item scale of both variables also showed high reliability ($\alpha=0.97$).

4 Results

Descriptive statistics

No differences in gender ($F(3,722) = 1.34, p = 0.26$) or age ($F(3,722) = .53, p = 0.66$) were found among the four conditions. The manipulation check revealed main effects for risk perception, self-efficacy and response efficacy, all in the predicted directions (risk perception ($F(1,722) = 97.69, p < 0.01$); self-efficacy ($F(1,722) = 51.50, p < 0.01$) and response efficacy ($F(1,722) = 45.08, p < 0.01$). Furthermore, no strong correlations were found between level of risk perception and self-efficacy ($r = 0.15$) or between risk perception and response efficacy ($r = 0.15$), indicating that the manipulations were relatively independent and only enhanced the targeted variable, without increasing the levels of the other variables. Therefore, we can conclude that the manipulations were successful. A positive

and highly significant correlation was found between self-efficacy and response efficacy ($r= 0.84$), allowing us to combine the two factors to a new factor efficacy for further analyses.

Table 2 presents the mean scores for the separate conditions for all dependent variables, and the overall mean scores and standard deviations.

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Information seeking behavior

Hypothesis 1a and 1b were tested using ANOVA. The effect of risk perception and efficacy beliefs on information seeking behavior was measured. As shown in Table 2, significant main effects of risk perception ($F(1, 722) = 58.27, p < 0.01, \eta^2 = .08$) and efficacy beliefs ($F(1, 722) = 22.74, p < 0.01, \eta^2 = .04$) on actual information seeking behavior were found. No interaction effect between the two variables existed ($F(1, 722) = 1.56, p = 0.22$). With regard to the intention to seek relevant risk information, we found significant effects of risk perception ($F(1, 722) = 37.29, p < 0.01, \eta^2 = .06$) and efficacy beliefs ($F(1, 722) = 68.45, p < 0.01, \eta^2 = .11$). No interaction effect was found ($F(1, 722) = 0.61, p = 0.43$).

Inspection of the mean scores in Table 2 shows that respondents in the high risk perception/high efficacy condition scored significantly higher on both actual information seeking behavior ($M=0.96$) and intended information seeking behavior ($M=3.40$) than the respondents in each of the other conditions. Furthermore, respondents in the low risk perception/low efficacy condition showed the least actual information seeking behavior ($M=0.62$) and intended information seeking behavior ($M=2.35$). This is consistent with our hypotheses.

Furthermore, we looked at the relationship between actual and intended information seeking behavior to ensure that the intention to seek relevant risk information corresponded with the actual behavior of citizens. Correlations were significant ($r= 0.50$), indicating that the two concepts are related.

Intention to take risk-mitigating or preventive actions

With regard to the intention to take risk-mitigating or preventive actions, hypotheses 2a and 2b were tested using ANOVA. Results indicated significant main effects of both risk perception ($F(1, 722) =$

31.21, $p < 0.01$, $\eta^2 = .05$) and efficacy beliefs ($F(1, 722) = 101.10$, $p < 0.01$, $\eta^2 = .13$) regarding one's intention to take self-protective measures. No interaction effect between risk perception and efficacy beliefs was found ($F(1, 722) = 0.29$, $p = 0.59$).

Inspection of the mean scores in Table 2 indicates that respondents in the high risk perception/high efficacy condition showed the most intention to take preventive actions ($M = 3.86$) compared to respondents in each of the other conditions, as expected; this result was statistically significant. Respondents in the low risk perception/low efficacy condition showed a significantly lower intention to take preventive actions ($M = 2.78$). These results support our second set of hypotheses.

Relationship between information-seeking behavior and the intention to take preventive actions

With regard to the relationship between information seeking behavior and the intention to engage in risk-mitigating and preventive behavior, hypothesis 3 was formulated. Results show that the level of intended information-seeking behavior and the intention to take risk-mitigating or preventive actions correlated strongly and positively ($r = 0.78$). Furthermore, respondents showing actual information seeking behavior were significantly more willing to engage in risk-mitigating or preventive behaviors than respondents showing no actual risk information-seeking behavior ($F(1, 722) = 68.87$, $p < 0.01$, $\eta^2 = .03$). These findings supported the third hypothesis.

Mediation effect information seeking behavior

A mediation analysis tested the hypothesis that information seeking behavior mediates the relationship between risk perception and efficacy beliefs on the one hand, and the intention of respondents to engage in self-protective behavior on the other (cf. Baron and Kenny 1986). The first regression analysis analyzing the intention to engage in self-protective behavior as dependent variable and risk perception as the predictor yielded a significant relation ($\beta = .45$, $p < 0.01$). A second regression analysis, with the mediator (information seeking behavior) as the dependent variable and risk perception as the predictor, showed that risk perception influenced information-seeking behavior significantly ($\beta = .47$, $p < 0.01$). Subsequently, following the procedure of Baron and Kenny (1986), a regression analysis with risk perception and information seeking behavior as predictors and the intention to engage in self-protective behavior as the dependent revealed that the previously found relationship between risk perception and the intention to take self-protective behavior became less

significant ($\beta = 0.11$, $p < 0.05$), whereas the mediator and the dependent showed a highly significant relation ($\beta = .73$, $p < 0.01$), which indicated partial mediation of information seeking behavior (figure 2). A Sobel test (Baron and Kenny 1986) confirmed that information-seeking behavior mediated the relation between risk perception and the intention of respondents to engage in self-protection ($Z = 11.25$, $p < 0.01$).

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The same analyses were conducted with efficacy beliefs as independent variable. The first regression analysis that analyzed the intention to engage in self-protective behavior as dependent variable and efficacy beliefs as the predictor, yielded a significant relation ($\beta = .71$, $p < 0.01$). A second regression analysis with the mediator (information seeking behavior) as the dependent variable and efficacy beliefs as the predictor, showed that efficacy beliefs influenced information-seeking behavior significantly ($\beta = .53$, $p < 0.01$). The regression analysis, with efficacy beliefs and information-seeking behavior as predictors and the intention to take self-protective behavior as the criterion, revealed that the previously discussed relationship between efficacy beliefs and the intention to engage in self-protective behaviors remained significant ($\beta = .41$, $p < 0.01$), whereas the mediator showed a highly significant relation with the dependent ($\beta = .56$, $p < 0.01$), which indicated partial mediation of information seeking behavior (figure 3). A Sobel test (Baron and Kenny 1986) confirmed that information-seeking behavior mediated the relation between risk perception and the intention of respondents to engage in self-protection ($Z = 16.09$, $p < 0.01$).

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5 Discussion

This study contributes to the small body of literature available on the effects of risk perception and efficacy beliefs in the domain of risk communication and, in particular, flood risk communication. This area has been receiving attention only recently (see e.g., Zaalberg et al. 2009; Terpstra and Gutteling, 2008; Terpstra et al. 2009; Terpstra 2010). From our perspective, the study has scientific, societal, and

practical importance. It recognizes the need to enhance levels of risk perception and efficacy beliefs as well as the need to stimulate individuals' interest in actively seeking information. This effort would be made with the intention of increasing one's motivation to adopt self-protective behaviors. The experiment with participants that actually live in flood-prone areas in the Netherlands indicates that flood risk communication can be effective in stimulating both information seeking and self-protective behavioral intentions. Results show that, compared to lower levels, higher levels of induced risk-perception and efficacy beliefs result in significantly higher levels of interest in information seeking and intention to engage in self-protective behavior. This result is novel because, as far as we know, it has not been reported with respect to flood risk communication. The societal importance is related to the scarcity of evidence that individual flood-related self-protective behavior can be stimulated with relatively simple risk communication tools, which is important in the context of future climate change and the rising of sea-levels.

We also observe that respondents engaging in the gathering of relevant risk information have more intention to take preventive measures than those who are not seeking the information. Furthermore, the seeking of information turned out to be a partial mediator between the independent variables risk perception and efficacy and the intention to engage in preventive actions, thus indicating that enhancing information-seeking might have positive impacts on the intention to take preventive actions among citizens. This finding, too, is a novel result. The study thus supports research efforts in the domain of risk information-seeking (e.g., ter Huurne, 2008), with the stimulation of self-protective behaviors in the population as a secondary goal. Therefore, the focus of flood risk communication research should not only be improving risk message effectiveness but should also focus on the determinants of public risk information-seeking. To date, only few studies have been reported on this topic, and many risk communication efforts aimed at stimulating self-protective behavior do not involve information seeking processes. Therefore, additional research is needed here.

Based on previous risk information-seeking studies (ter Huurne, 2008) one can assume that risk-awareness variables such as risk perception (is there a threat?), personal involvement (is the threat relevant to me?), and self-efficacy (am I able to deal with the threat?) are the triggers that can be used to stimulate the public's motivation to seek risk information. In this experiment, we looked at risk perception and efficacy, assuming that personal involvement would be high because all of our participants lived in flood-prone areas. However, additional research is needed to provide a better

understanding of the role of personal involvement in this type of risk communication. Of course, governmental and other organizations can stimulate the seeking of risk information by providing the information through a multitude of channels and having it available at all times, as is possible on the Internet.

The results provide valuable implications for future risk communication efforts with respect to the flood preparedness of the Dutch public and may have similar implications for other risk communication directed at preparative actions. First, to motivate the general public to engage in self-protective behavior, a certain level of risk awareness (or threat) is necessary in the communication efforts to motivate citizens to actively engage in information-seeking and to adopt self-protective recommendations. Furthermore, the results of this study suggests that risk messages aimed at promoting self-protective actions are effective under the conditions that the advised actions are perceived by the public along with high self-efficacy (Yes, you can do it) and high response efficacy (Yes, it works). The preparation of such public service messages aimed at flood risk communication is thus of the utmost importance. The designers of these messages no longer can suffice to take their own perception of message effectiveness as the sole guideline. Messages should be carefully designed along the lines of behavioral actions that are seen as efficacious by large numbers of people. Pre-testing these messages seems necessary, and most likely, the effort spent will pay off.

The results of this study must be viewed in the light of some limitations that need to be addressed. First of all, actual information seeking behavior was measured using only one item. The use of only one item can result in drawing biased conclusions about the information-seeking behavior among respondents. Therefore, using more items to measure information-seeking behavior seems advisable. Also, taking preventive actions was measured by asking respondents about their intention to adopt recommendations. As the intention a person has to adopt certain behaviors does not always correspond to their actual behavior, this may give a slightly biased view of the preventive actions taken among respondents.

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Figure 1. Model of expected mediation by information seeking behavior.

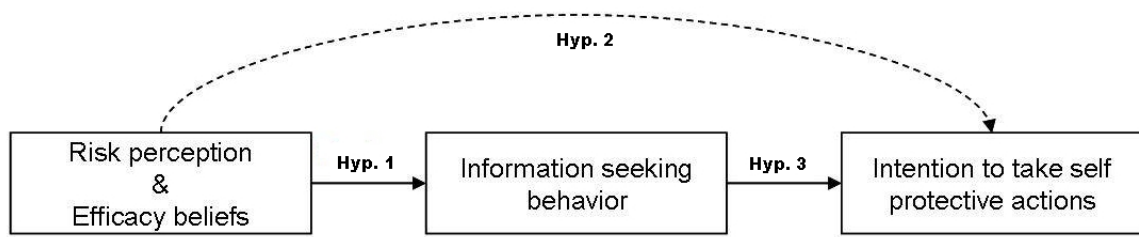


Table 1. Four experimental with corresponding manipulations of risk perception and perceived efficacy.

		Risk perception	
Perceived efficacy		<i>High</i>	<i>Low</i>
<i>High</i>	Condition 1:	<ul style="list-style-type: none"> • High ‘personal risk’ message • Fear appeal • High self-efficacy message • High response efficacy message 	Condition 2:
			<ul style="list-style-type: none"> • Low ‘personal risk’ message • No fear appeal • High self-efficacy message • High response efficacy message
<i>Low</i>	Condition 3:	<ul style="list-style-type: none"> • High ‘personal risk’ message • Fear appeal • Low self-efficacy message • Low response efficacy message 	Condition 4:
			<ul style="list-style-type: none"> • Low ‘personal risk’ message • No fear appeal • Low self-efficacy message • Low response efficacy message

Table 2. Four experimental conditions with corresponding mean scores for all dependent variables.

	Actual information seeking	Intended Information seeking	Intention to take self-protective measures
Condition 1 N=238 High level risk perception High level efficacy	0.96**	3.40**	3.86**
Condition 2 N=174 Low level risk perception High level efficacy	0.78	2.90	3.51
Condition 3 N=158 High level risk perception Low level efficacy	0.86	2.74	3.20
Condition 4 N=156 Low level risk perception Low level efficacy	0.62#	2.35#	2.78#
Mean total	0.82	2.91	3.40
Std. total	0.39	1.04	0.99

N=726. ** Mean score is significantly higher than other scores at the 0.01 level; # Mean score is significantly lower than other scores at the 0.01 level (2-tailed)
Scale: Information seeking: 1 = relevant, 0 = irrelevant. Other variables: 1 = strongly disagree to 5 = strongly agree

Figure 2. Mediation model with independent variable risk perception, showing betas.

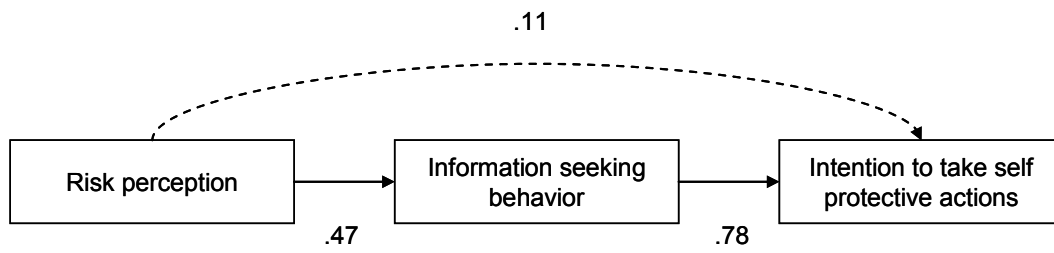
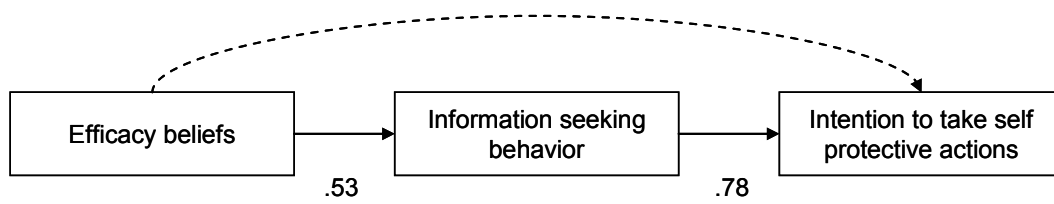


Figure 3. Mediation model with independent variable efficacy beliefs, showing betas.
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Appendix 1. Pictures manipulation.

Fear appeal



No fear appeal

