Applying the CERC model within the context of extreme weather: A study about the influence of the timing and efficacy beliefs on information seeking and self-protective behaviors.

Master Thesis* – University of Twente

Abstract

The Crisis And Emergency Risk Communication (CERC) model emphasises communicating risks in the stages before and after a crisis or risk event. This research tested the importance of these stages by manipulating the timing (pre-crisis versus post-crisis) and efficacy beliefs (low versus high) in the risk message. A two by two between subject experiment was conducted to test the effect on the perceived threat, the perceived efficacy, information seeking and self-protective behaviors in the context of extreme weather. Results show that one is significantly more likely to seek post-crisis risk information than pre-crisis risk information and that the risk is perceived significantly higher in the post-crisis stage. Interestingly, the perceived threat turned out to be significant predictor of information seeking and the perceived threat and perceived efficacy turned out to be significant predictors of self-protective behaviors. Manipulating the efficacy beliefs did not have a significant effect. Implications for communication professionals on communicating in the post-crisis stage are discussed.

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Introduction

During a heavy storm in January 1990, 17 people were killed (KNMI, 2012a). In July and August 2003, around 1000 tot 1400 elderly people died due to extreme heat (CBS, 2003). In November 2005, snow accumulation caused several roofs to collapse and a power shutdown for 60 hours (KNMI, 2012b) . In July 2010, 2 people died on a campsite due to heavy thunderstorms and wind gusts (Groenland, Hemink, Kuiper & Wever, 2010). All given examples show the impact of extreme weather in the Netherlands. Extreme weather does not only cause personal harm but also financial harm. To illustrate, insurance companies raised their prices with 5 to 15 percent as a consequence of rainfall in August 2012 (AD.nl, 2012). Taking measures against the consequences of extreme weather would thus be beneficial in a personal and financial way. To prevent damage and casualties, KNMI has the job to inform the Dutch public about dangerous or extreme weather when it is expected.

Communicating about extreme weather

KNMI communicates about dangerous or extreme weather in the moments before or during the extreme weather (KNMI, 2013). If necessary, KNMI will warn for dangerous weather (code yellow) or extreme weather (code orange) or issue a weather alarm (code red). KNMI will only communicate about dangerous or extreme weather in the 48 hours perceeding and during the extreme weather event. After all, weather forecasts are predictions which are most of the time uncertain until the last moment (Roulston, Bolton, Kleit & Sears-Collins, 2005; Gigerenzer, Hertwig, van den Broek & Katsikopoulosi, 2005). Besides the moment just before and during extreme weather, KNMI does in general not communicate about the reasons why some types of extreme weather are dangerous or how one may take precautions to protect his or her property or life.

According to Reynolds and Seeger (2005) it would be very beneficial to communicate about a risk at different moment. They emphasise in their CERC model on communicating about a risk in five different stages of crisis or event. In short, one should communicate about the risk (1) in the stages far before a crisis or event, (2) when the event is expected or initiated, (3) and after the crisis or event. Recent research from Van Leeuwen (2012) focused on manipulating fear appeals and efficacy beliefs in the communication just before and during an extreme weather event. In other words, when the event is expected or initiated. The manipulations showed no significant effect on information seeking or self-protective behaviors (Van Leeuwen, 2012). This research will extend the research from Van Leeuwen (2012) by focusing on the communication before and after an extreme weather. Doing so, this will test the importance and effectiveness of communication before and after an extreme weather and thus test the communication process as displayed by Reynolds and Seeger (2005).

Goal of this research

Because no research has yet focused on the effectiveness of risk communication in the stages before or after a crisis event, this research will test if the timing of risk communication will influence information seeking and intention to engage self-protective behaviors. In other words, this research will test the process as displayed in the CERC model from Reynolds and Seeger (2005). In addition, this research will also test if manipulating the efficacy beliefs by telling one that he or she is able to deal with the risk, leads to a higher intention to engage in self-protective behaviors. Research from Van Leeuwen (2012) showed that manipulating the efficacy beliefs did not have a significant

influence on information seeking or self-protective behaviors whereas research from Kievik and Gutteling (2010) showed a significant influence from manipulating the efficacy beliefs. Therefore, the main research question in this research is:

To what extent does the timing (pre-crisis stage versus post-crisis stage) of the risk message and efficacy beliefs (low versus high) in the risk message influences information seeking and self-protecting behaviors?

The answer on the research question will fill in two gaps in the literature. First, it will test if the timing of the risk message is influencing information seeking and self-protective behaviors. It will thus test the communication process as displayed in the CERC model from Reynolds and Seeger (2005). Second, it will test if telling one that he or she is able to deal with the risk has an influence on self-protective behaviors to find support for previous findings from Kievik and Gutteling (2010). The answer of the research question will also give valuable information for KNMI about when and how to communicate about the risks of extreme weather and how one might take precautions to protect his or her property and life.

Theoretical Framework

According to Reynolds and Seeger (2005) risk communication should facilitate decision making by giving the public information about risks and hazards. After all, the public has the metaphorical right to know about certain risks and hazards to protect themselves (Reynolds & Seeger, 2005). However, communicating about hazards and risks is much more complex than just letting the public know about hazards and risks. For example, one will react differently to risk communication when he or she is in danger or in life threatening situations (Reynolds, 2011). It would therefore be helpful to adapt the communication to the needs of the public at specific moments (Quinn, 2008; Miller, 2009). Reynolds and Seeger (2005) developed a crisis and emergency risk communication (CERC) model that could be used as a tool for communication professionals to adapt crisis and risk communication to the public needs. Doing so may facilitate the public in making better decisions to protect themselves. The process model shows the process of a crisis or event and what type of communication would fit each particular moment. See also table 1 in which the different stages are explained.

Table 1: The Crisis and Emergency Risk Communication model based on Reynolds and Seeger (2005)

Stage	Communication goal	Term used in this research to indicate stage
Pre-crisis	**Risk communication** → Create understanding of the risk among public and explain how the public might avoid or reduce the risk.	Pre-crisis stage.
Initial event	**Crisis communication** → Create understanding of the circumstances and consequences of the specific crisis and inform about how and where to get more information to cope with the crisis.	The crisis or event.
Maintenance	**Crisis communication** → Create more specific understanding of the circumstance and keep informing about how and where to get more information to cope with the crisis.	The crisis or event.
Resolution	**Risk communication** → Discuss the crisis event and specific consequences and warn for new or consequential risks of the crisis.	Post-crisis stage.
Evaluation	**Risk communication** → Create a link to the pre-crisis stage and describe what can be learned and done to avoid risk in the future.	Post-crisis stage.

The CERC model is thus a process model and shows where risk and crisis communication is important. The model is used by thousands of professionals who deal with risk communication and crisis situations in the public health care (Reynolds & Seeger, 2005). Interestingly, risk communication is not only important in the stages before a crisis (pre-crisis stage) but also in the stages after a crisis (resolution and evaluation stage). This is because there is more time in these stages to communicate important information and to persuade one (Reynolds & Seeger, 2005). Crisis communication seems to be very important in the initial event and maintenance stage because there is less time to communicate important information during a crisis (Reynolds & Seeger, 2005; Miller, 2009).

Reynolds and Seeger (2005) describe five different stages in their CERC model. However, in the context of extreme weather it is questionable if it is still possible to distinguish five different stages during an extreme weather event. In general, an extreme weather event does not last longer than one day. It is therefore that this research will use a more simplified process model of the CERC model. This simplified CERC model shows exactly what the focus is in this research, namely to find how risk communication can be deployed during the pre-crisis and post-crisis stage and to test the effectiveness in terms of information seeking and self-protective behaviors. The reason why it is possible to simplify the model, is because the differences in time between the initial event (stage 2) and maintenance stage (stage 3) and the resolution (stage 4) and evaluation stage (stage 5) are considered small in the context of extreme weather. The initial event (stage 2) and the maintenance stage (stage 3) can be combined into one stage because these stages are both focusing on creating understanding of the extreme weather and keeping stakeholders updated. Both stages are therefore combined into one stage, namely the 'crisis or event'. The resolution (stage 4) and evaluation stage (stage 5) are both focusing on explaining the consequences of the extreme weather to create understanding of new risks based on the extreme weather event. Both stages are therefore combined into one stage, namely the 'post-crisis stage'. Interestingly, some organizations also use this stage to protect or repair their image or reputation (Coombs, 2006). However, in the CERC model the focus lies on creating a better understanding of consequences of the risks and on how the risk can be reduced during future events (Reynolds & Seeger, 2005).

The CERC model as a process

Following the CERC model from Reynolds and Seeger (2005), communication in the post-crisis stage is essential. The communication should focus on new information and understandings of risks and how risks can be avoided or reduced in the future. Interestingly, the communication during the post-crisis stage looks similar as the communication during the pre-crisis stage. Communication in the pre-crisis stage also focuses on how risks can be better understood in the future and how one can avoid or reduce risks in the future (Reynolds & Seeger, 2005). This suggests that the CERC model is like a continuing process in which the post-crisis stage transforms into the pre-crisis stage. This may especially be the case in the context of extreme weather because extreme weather can occur again. This also suggests that the CERC model is applicable in the context of extreme weather because it is likely that one will face the extreme weather again.

There is however a difference. In the post-crisis stage specific consequences of the observed extreme weather can be given while in the pre-crisis stage only generic information can be given about what the consequences might be. It is possible that giving specific consequences or experiencing the risk will influence the perceived threat and the motivation to engage in self-protective behaviors in the future. Research from McArdle, Rosoff, and John (2012) showed that the perceived threat of a terrorist attack increased after occurrence. In addition, research from Zaalberg. Midden, Meijnders and McCalley (2009) showed that victims of flooding worry more about flooding than non-victims and that they were more likely to engage in self-protective behaviors than non-victims. In other words, it is possible that after a crisis or event one is more receptive towards the risk and how the risk can be avoided in the future because the threat is perceived as higher. According to Witte (1992), the perceived threat is a predictor of acceptance or rejection of risk messages. In other words, how the threat is perceived may influence the way in which one reacts on risk messages that stimulate self-protective behavior. The higher the perceived threat, the more likely one is to do

something with the risk message (Witte, 1992; Gore & Bracken, 2005). The influence from the perceived threat is also displayed in the Extended Parallel Process Model (EPPM) from Witte (1992) which will be discussed in the next paragraph.

Information seeking

If KNMI wants to provide the Dutch public with more information before and after the extreme weather event, it is necessary to find out why one would seek for information in the first place. People seek information to fill a gap or need in knowledge of a certain topic (Griffin, Dunwoody & Neuwirth, 1999). Interestingly, information seeking behavior has gained a lot of attention in the area of risk communication. The main reason why a great deal of studies focus on information seeking is probably because people do not automatically show information seeking behavior. To illustrate, Miller (1995) did research on information seeking and found that either people monitor (seek) or blunt (avoid) information. People who monitor are more satisfied with more information whereas people who blunt are more satisfied with less information (Miller, 1995). The EPPM from Witte (1992) focused on why one would accept or reject risk messages. This model is very useful to test the acceptance of risk messages after a crisis or event because the focus of the model lies on the information given or in other words the message components of the risk message (Witte, 1992). The EPPM can thus be used to explain acceptance or rejection of risk messages. This is also the reason why the EPPM was also used to evaluate the effectiveness of brochures (Smith et al., 2008), campaigns (Evans, Beeken, Steptoe & Wardle, 2011), and advertisements (Tay & Watson, 2002).

Perceived threat and perceived efficacy

According to the EPPM (Witte, 1992), components in the risk message will influence self-efficacy, response efficacy, susceptibility, and severity (Witte, 1992; Gore & Bracken, 2005). First, self-efficacy refers to the perception that a person has of his or her ability to perform tasks to avoid or reduce risk of a threat. Second, response efficacy refers to the believability that particular tasks will indeed help to reduce or avoid. Self-efficacy and response efficacy lead to the perceived efficacy or efficacy beliefs. Third, susceptibility refers to the subjective feeling that one has about the chance that the risk is able to harm him or her. Fourth, severity refers to the seriousness and consequences of the risk. Susceptibility and severity lead to the perceived threat (Witte, 1992). If the threat is perceived as low, no response will be given to the message (Witte, 1992; Gore & Bracken, 2005). If the perceived efficacy is low and the perceived threat is high, one is more likely to reject the risk message. This process is called fear control in which one ignores the message and danger (Witte, 1992). If the perceived efficacy and the perceived threat are both high, one is more likely to accept the risk message. This process is called danger control in which one perceives the message concerning the danger as useful (Witte, 1992).

From accepting risk messages to self-protective behaviors

The goal of risk communication is to inform one how to avoid or reduce the risk (Reynolds & Seeger, 2005). But does the acceptation of risk messages also lead to self-protective behaviors? According to research from Witte and Allen (2000), the stronger the fear appeal in the EPPM the more persuasive the risk message is. The behavior that follows is either self-protective or defensive. Witte and Allen (2000) could not determine if self-protective behaviors were associated with either fear or danger control. In later research from Gore and Bracken (2005) self-protective behaviors were associated with danger control. However, a high perceived threat was necessary to motivate self-protective

behaviors (Gore and Bracken, 2005). Research from Kievik and Gutteling (2010) also found that information seeking and intention to engage in self-protective behaviors correlate with each other. In addition, the perceived threat and perceived efficacy could also be seen as predictors of self-protective behaviors.

Perhaps one of the most important factors to engage in self-protective behaviors is the efficacy information. To illustrate, research from Evans et al. (2011) showed that giving specific information about how one can examine himself on testicular cancer increased the intention to self-examine. Research from Tay and Watson (2002) showed that efficacy information in the form of coping strategies positively influenced self-protective behaviors in the context of road safety communication. Research from Smith et al. (2008) also showed that it is important to give efficacy information. However, it was not only the perceived efficacy but also the perceived threat which could be seen as a predictor of self-protective behaviors. Their study showed that farmers and landscape workers would only take self-protective behaviors if the perceived threat and perceived efficacy were high (Smith et al., 2008). Thus research shows that risk communication should contain efficacy information in order to be effective and influences self-protective behaviors (Witte, 1992; Tay & Watson, 2002; Gore & Bracken, 2005; Smith et al., 2008; Kievik & Gutteling, 2010; Evans et al., 2011). Interestingly, recent research from Kievik and Gutteling (2010) also showed that efficacy information in the form of telling one that he or she is able to deal with the risk, leads to a higher perceived efficacy and resulted in higher level of self-protective behaviors.

Only a few researchers focused on the acceptance or rejection of risk message in the context of extreme weather. Van Leeuwen (2012) did research and used the EPPM in the context of extreme weather to explain acceptance and rejection of risk messages. This research was also conducted at KNMI. Interestingly, she found that manipulating the fear appeal and efficacy beliefs positively influenced information seeking and self-protective behaviors. However, the results were not significant. Van Leeuwen (2012) showed that a higher perceived threat, a higher perceived efficacy, and a higher level of information seeking resulted in a higher intention to engage in self-protective behaviors in the context of extreme weather.

Hypotheses

H1a: The perceived threat will be higher in the post-crisis stage compared to the pre crisis stage.

H1b: The perceived efficacy will be higher in the high efficacy condition compared to the low efficacy condition.

In hypothesis 1a, it is expected that communicating after an extreme weather event will have a positive influence on the perceived threat. This expectation is based on the fact that specific consequences can be given of the crisis or event. In other words, the consequences of the risk become much more explicit and therefore more threatening. Other research from Zaalberg et al. (2009) and McArdle et al. (2012) also showed that the perceived threat increased after risk events. Hypothesis 1b is based on research from Kievik and Gutteling (2010). According to Kievik and Gutteling (2010) communicating high efficacy beliefs in terms of telling one that he or she is able to perform certain tasks will lead to a higher perceived efficacy among respondents.

H2a: Information seeking will be higher in the post-crisis stage compared to the pre-crisis stage.

H2b: Information seeking will be higher in the high efficacy condition compared to the low efficacy condition.

H2c: An interaction effect will be found between the timing and efficacy beliefs on information seeking.

Hypothesis 2a is based on the EPPM (Witte, 1992). The model shows that the higher the threat is perceived, the more likely one is to respond to the message. In this research, it is expected that communicating after an extreme weather event will have a positive influence on information seeking because the threat is perceived as higher. Hypothesis 2b is also based on the EPPM (Witte, 1992) in which a higher perceived efficacy will increase the likeliness that one will accept the risk message or seek similar information. As stated, it is here expected that telling one that he or she is able to perform certain tasks will lead to a higher perceived efficacy. Consequently, a high perceived efficacy will lead to a higher intention to seek information (Witte, 1992; Kievik & Gutteling, 2010). It is therefore here hypothesized that the information seeking will be higher in the high efficacy condition compared to the low efficacy condition. Hypothesis 2c is not based on previous research because no similar research has yet been conducted. However, this hypothesis will test if an interaction effect takes place between the manipulation of the efficacy beliefs and the timing on information seeking.

H3a: The intention to engage in self-protective behaviors will be higher in the post-crisis stage compared to the pre-crisis stage.

H3b: The intention to engage in self-protective behaviors will be higher in the high efficacy condition compared to the low efficacy condition.

H3c: An interaction effect will be found between the timing and efficacy beliefs on intention to engage in self-protective behaviours.

Hypothesis 3a is based on the research from Zaalberg et al. (2008). Zaalberg et al. (2008) showed that victims of flooding were more likely to engage in self-protective behaviors than non-victims. It is here also expected that the perceived threat will increase after a risk event. Consequently, this would lead to a higher intention to engage in self-protective behaviors because a higher perceived threat is associated with a higher intention to engage in self-protective behaviors (Gore & Bracken, 2005; Kievik & Gutteling, 2010). The research from Kievik and Gutteling (2010) and Gore and Bracken (2005) also showed that a higher perceived efficacy also led to a higher intention to engage in self-protective behaviors. As discussed, it is here expected that the perceived efficacy will be higher in the high efficacy beliefs condition compared to the low efficacy condition stage. This would support hypothesis 3b in which it is hypothesised that intention to engage in self-protective behaviors will be higher in the high efficacy condition. Hypothesis 3c is not based on previous research because no similar research has yet been conducted. However, this hypothesis will test if an interaction effect takes place between the manipulation of the efficacy beliefs and the timing on the intention to engage in self-protective behaviors.

H4a: Information seeking will correlate with intention to engage in self-protective behaviors.

H4b: The perceived threat and perceived efficacy will correlate with information seeking.

H4c: The perceived threat and perceived efficacy will correlate with intention to engage in self protective behaviors.

Hypothesis 4a is based on research from Kievik and Gutteling (2010) and Van Leeuwen (2012) who showed that information seeking correlates with engaging in self-protective behaviors. Hypothesis 4b and 4c are based on research from Gore and Bracken (2005), Kievik and Gutteling (2010), and Van Leeuwen (2012). All of the research showed that the perceived threat and the perceived efficacy correlate with accepting risk messages and self-protective behaviors.

H5a: Risk messages including high efficacy beliefs will receive a higher overall judgement than risk messages including low efficacy beliefs.

H5b: Risk messages in the post-crisis stage will receive a higher overall judgement than risk messages in the pre-crisis stage.

Hypothesis 5a and 5b will test the overall judgment of the risk messages used in the questionnaire. This will give valuable information about how the timing of the risk communication and the efficacy beliefs influence the overall judgement of the risk communication terms of utility, seriousness, and credibility. It is here expected that the overall judgement of the risk messages used is perceived higher in the high efficacy condition than in the low efficacy condition. This expectation is based on research from Kievik and Gutteling (2010) in which they found that high efficacy beliefs led to more information seeking. It is also expected that risk messages will receive a higher overall judgement in the post-crisis stage than in the pre-crisis stage. This expectation is based on the hypothesis that the risk will be perceived higher in the post-crisis stage than in the pre-crisis stage.

Research Design

To answer the research question, a two (timing: pre-crisis versus post-crisis) by two (efficacy beliefs: high versus low) between subjects experiment was conducted. Risk messages were manipulated and shown in an online questionnaire in which respondents had to read the risk message. After reading, they had to fill in questions about the perceived threat, perceived efficacy, information seeking, intention to engage in self-protective behaviors and the overall judgment of the risk message. After starting the questionnaire, each respondent was randomly assigned to one of the four risk messages in order to equally distribute the different risk messages among the sample. At the end of the questionnaire, respondents were asked to fill in their gender, year of birth, and level of education. See also the complete questionnaire in Appendix A and the risk messages in Appendix B. In the overview below, the risk messages and manipulations are visualized. To keep all the variables as constant as possible, the choice was made to give all the risk messages the same structure.

Table 2: Research design

	Pre-Crisis stage	**Post-Crisis stage**
Low efficacy beliefs	**Risk message 1:** - Possible consequences of extreme weather. - How risk can be avoided or reduced during extreme weather event.	**Risk message 3** - Consequences of extreme weather. - Risk avoidance or reduction based on extreme weather event.
High efficacy beliefs	**Risk message 2:** - Possible consequences of extreme weather. - How risk can be avoided or reduced during extreme weather event. - Communicating that he or she is able to perform tasks to reduce the risk.	**Risk message 4** - Consequences of extreme weather. - Risk avoidance or reduction based on extreme weather event. - Communicating that he or she is able to perform tasks to reduce the risk.

According to the CERC model (Reynolds and Seeger, 2005), it is important to communicate in the pre-crisis stage the consequences of the risk and how they can be avoided or reduced in the future. This will be tested by writing risk message 1 and 2 in a way that the extreme weather event did not yet occur and risk message 3 and 4 in a way that the extreme weather just occurred. In other words, it will look like message 1 and 2 are spread during the pre-crisis stage of the extreme weather event while risk message 3 and 4 are spread during the post-crisis stage of the extreme weather event. This will show how the timing of the message influences the perceived threat, the perceived efficacy, the acceptation of risk messages, and intention to engage in self-protective behaviors.

According to the EPPM from Witte (1992), risk messages should lead to a high perceived threat and to a higher perceived efficacy in order to accept the risk messages. Therefore, all the messages contained a fear appeal and efficacy information. The fear appeals in the messages were two pictures of an extreme weather event and an explanation of its consequences. The efficacy

information contained instructions about how one can take precautions to reduce the risk of financial and personal harm. According to the EPPM (Witte, 1992; Gore & Bracken, 2005) the risk communicated must be perceived as both high and realistic. For this reason, the risk messages were based on an extreme weather event that really occurred and was particularly dangerous for the Dutch society. Thundershowers were selected as the extreme weather event. General consequences (pre-crisis stage) were based on data from KNMI on thunderstorms (KNMI, 2012) and specific consequences (post-crisis stage) were based on the thundershowers from the 14th of July 2010 (Groenland, Hemink, Kuiper & Wever, 2010). Research shows that efficacy information is an important element in making risk communication effective (Tay & Watson, 2002; Gore & Bracken, 2005; Smith et al., 2008; Kievik & Gutteling, 2010; Evans et al., 2011). Therefore, efficacy information was presented in all risk messages. Information was given about how one can avoid or reduce the risk of the extreme weather event. However, risk message 2 and 4 represent high efficacy beliefs while risk message 1 and 3 represent low efficacy beliefs. Risk message 2 and 4 will communicate that one is able to perform the specific tasks to reduce or avoid the risk while risk message 1 and 3 will only communicate how the risk can be reduced or avoided. This is similar as in the research from Kievik and Gutteling (2010).

Measurement and variables

As discussed, the manipulated variables in this research are the timing and efficacy beliefs. The dependent variables in this research are information seeking and intention to engage in self-protective behaviors. Intervening variables that influence information seeking are based on the EEPM

Table 3: Overview of variables; measured with a five point Likert scale ranging from fully disagree (1) to fully agree (5).

Type of variable	Variable	Variable in detail
Intervening variables	Perceived threat	Perceived threat is measured by 6 items that measured the severity and susceptibility. The six items have a Cronbach's Alpha of .79 in this research which is sufficient.
	Perceived efficacy	Perceived efficacy is measured by 6 items that measured the response efficacy and self-efficacy. The six items have a Cronbach's Alpha of .85 in this research which is sufficient.
Dependent variables	Information seeking	Information seeking is measured by 3 items. The three items have a Cronbach's Alpha of .83 in this research which is sufficient.
	Intention to engage in self-protective behaviors	Intention to engage in self-protective behaviors is measured by 3 items. The three items have a Cronbach's Alpha of .85 in this research which is sufficient.
Other variables	Overall judgment of risk message	The overall judgement is measured by 3 items. The three items have a Cronbach's Alpha of .83 in this research which is sufficient.
	Demographic information of respondent	Respondents will be asked to fill in their gender, age and level of education. The data will be used to test if demographic variables influence the results.

(Witte, 1992) and are the perceived threat and the perceived efficacy. All of the discussed variables are measured in the questionnaire with a five point Likert scale ranging from fully disagree (1) to fully agree (5). The items were based on research from Van Leeuwen (2012) and Kievik and Gutteling (2010). An overview of the variables can be found in table 3. As explained, the variables were measured through a questionnaire which is shown in Appendix A. In the appendix it is shown which set of items belongs to which variable. Note that the questionnaire is written in Dutch because the research focuses on the Dutch public.

Sample

In total 234 respondents participated in this research with 224 finishing the complete questionnaire. To collect data, a non-probability sampling technique called convenience sampling was used. Respondents were collected via mailings and social media from the author of this master thesis. This means that it will not be possible to make generalizations about the complete Dutch population because not every member of the Dutch population had an equal chance to participate in this research. However, the sample used will still give valuable information about to what extent the timing and efficacy beliefs are influencing information seeking and self-protective behaviors. In other words, this convenient sample will still help to test the communication process and mechanisms as displayed in the CERC model from Reynolds and Seeger (2005).

As stated, respondents were randomly assigned to one of the risk messages. Every risk message was at least assigned to 50 respondents (with a minimum of 51 respondents for risk message 1 and a maximum of 66 respondents for risk message 3). There was no difference in gender ($F(1,224)=.88$, n.s), age ($F(1,224)=.60$, n.s), or education ($F(1,224)=.10$, n.s) between the pre-crisis stage and post-crisis stage conditions. There was also no difference in gender ($F(1,224)=1.50$, n.s), age ($F(3,224)=.23$, n.s), or education ($F(1,224)=1.34$, n.s) between the low efficacy and high efficacy conditions. Of the respondents 51.1% were female whereas 48.9% were male. The average age of the respondents was 36 years with a minimum of 16 years and a maximum of 85 years. The education level of the sample was relatively high with 38,2% graduating or participating a scientific education (WO), 29.8% graduating or participating a higher vocational education (HBO), 21.8% graduating or participating an intermediate vocational education (MBO), and 10.2% graduating or participating lower vocational education or high school.

Results

Table 3 shows the main results of this study. Based on these results, it seems that the manipulation of timing did have an influence on the perceived threat and information seeking and that the efficacy beliefs did have an influence on the perceived efficacy and self-protective behaviors. However, statistical analysis will test the results more extensively.

Table 3: The influence of the manipulations on the means of the intervening and dependent variables.

	Perceived Threat			***Perceived Efficacy***			***Information Seeking***			***Protective Behavior***		
	M	**SD**	**n**	**M**	**SD**	**n**	**M**	**SD**	**n**	**M**	**SD**	**n**
Pre-Crisis	3.31	.69	114	3.93	.56	114	2.50	.85	111	3.05	.88	111
Post-Crisis	3.54	.62	119	3.92	.56	119	2.74	.94	119	3.04	.86	119
Low Efficacy	3.39	.68	122	3.88	.57	122	2.63	.92	120	2.99	.85	120
High Efficacy	3.46	.66	111	3.98	.55	111	2.62	.89	110	3.10	.88	110

Influence from manipulation on intervening variables

To see how the manipulation of efficacy beliefs and timing influenced the perceived threat and efficacy, a two-way ANOVA was performed. The manipulation of the timing did have a significant influence on the perceived threat ($F(1,232)=7.22$, $p<.01$) supporting hypothesis 1a with a higher perceived risk in the post-crisis stage ($M=3.54$, $SD=.62$) compared to the pre-crisis stage ($M=3.31$, $SD=69$). The manipulation of timing did not have an influence on the perceived efficacy ($F(1,232)=.01$, n.s). The manipulation of the efficacy beliefs did not have an influence on the perceived efficacy ($F(1,232)=2.12$, n.s) which rejects hypothesis 1b. The manipulation of efficacy beliefs did not have an influence on the perceived threat ($F(1,232)=.75$, n.s). There were also no significant interaction effects between the manipulated variables for perceived threat ($F(1,232)=.00$, n.s) or perceived efficacy ($F(1,232)=1.00$, n.s).

Influence on information seeking

To test the influence from the manipulation of efficacy beliefs and timing on information seeking behavior, a two-way ANOVA was performed. The manipulation of the timing did have a significant influence on information seeking ($F(1,229)=4.44$, $p<.05$) which supports hypothesis 2a with a higher intention to seek information in the post-crisis stage($M=2.74$, $SD=.94$) than in the pre-crisis stage ($M=2.50$, $SD=.85$). The manipulation of the efficacy beliefs did not have a significant influence on information seeking ($F(1,229)=.00$, n.s) which rejects hypothesis 2b. There were also no significant interaction effects between the manipulated variables for information seeking ($F(1,229)=.47$, n.s) which rejects hypothesis 2c.

Influence on intention to engage in self-protective behaviors

To test the influence from the manipulation of efficacy beliefs and timing on intention to engage in self-protective behaviors, a two-way ANOVA was performed. The manipulation of the timing ($F(1,229)=.00$, n. s.) and efficacy beliefs ($F(1,229)=.80$, n. s.) did not have a significant influence on

self-protective behaviors which rejects hypothesis 3a and 3b. There were also no significant interaction effects between the manipulated variables for intention to engage in self-protective behaviors (F(1,229)=.50, n.s) which rejects hypothesis 3c.

Influence on overall judgment of the risk message

To test the influence on the overall judgment of the risk messages, a two-way ANOVA was performed. The manipulation of the timing (F(1,229)=.36, n.s) and efficacy beliefs (F(1,229=.02, n.s) did not have a significant effect on the overall judgment of the risk message which rejects hypothesis 5a and 5b. There were also no interaction effects between the manipulated variables for the overall judgment of the risk message (F(1,229)=.00, n.s).

Correlations and regression between variables

The most important variables in this research were also tested on correlations. This analysis showed that all the variables correlate with each other at α=0.01 level with the highest correlation between information seeking and protective behavior with *r*=0.60. In other words, information seeking is a significant predictor for self-protective behaviors (β=.60, t(227)=11.36, p<0.01) which supports hypothesis 4a. See also table 3 for a complete overview of all the correlations between the variables in this research.

Table 4: Overview of the correlation between the variables.

	Perceived Threat	***Perceived Efficacy***	***Information Seeking***	***Protective Behavior***	***Overall Judgment***
Perceived Threat	1				
Perceived Efficacy	.42**	1			
Information Seeking	.43**	.16**	1		
Protective Behavior	.48**	.38**	.60**	1	
Overall Judgment	.44**	.49**	.20**	.32**	1

*** p<0.05 ** p<0.01**

Regression analysis of intervening variables and information seeking

To test if the perceived threat and perceived efficacy can be seen as predictors of information seeking, a regression analysis was performed. This analysis showed that both perceived threat (β=.43, t(227)=7.18, p<0.01) and perceived efficacy (β=.16, t(227)=2.39, p=0.02) are significant predictors of information seeking. A higher perceived threat and perceived efficacy have a positive influence on information seeking which confirms hypothesis 4b. The perceived threat explains a higher (R^2=.18, F(1,228)=51.51, p<0.01) percentage of variance in information seeking than the

perceived efficacy (R^2=.02, F(1,228)=5.724, p=0.02). A multiple regression analysis with the timing, the perceived threat, and the perceived efficacy as predictors of information seeking gave different results. The relation between the timing (β=.07, t(225)=1.09, n.s) and information seeking and the perceived efficacy and information seeking (β= -.03, t(225)= -.39, n.s) became less significant whereas the relation between the perceived threat (β=.43, t(225)=6.38, p<0.01) and information seeking remained significant.

Regression analysis of intervening variables and self-protective behaviors

To test if the perceived threat and perceived efficacy can be seen as predictors of self-protective behaviors, a regression analysis was performed. This analysis showed that both perceived threat (β=.48, t(227)=8.17, p<0.01) and perceived efficacy (β=.38, t(227)=6.22, p<0.01) can be seen as predictors for self-protective behaviors. A higher perceived threat and perceived efficacy have a positive influence on self-protective behaviors which confirms hypothesis 4c. The perceived threat explained a higher (R^2=.22, F(1,228)=66.70, p<0.01) percentage of variance in self-protective behaviors than the perceived efficacy (R^2=.14, F(1,228)=38.70, p<0.01). A multiple regression analysis with the timing, the perceived threat, and the perceived efficacy as predictors of self-protective behaviors showed similar results. The relation between the perceived threat (β=.40, t(225)=6.23, p<0.01) and perceived efficacy (β=.21, t(225)=3.34, p<0.01) remained significant whereas the relation between the timing (β= -.07, t(225)= -1.28, n.s) and self-protective behaviors remained weak.

Regression analysis of manipulated variables and other variables

Earlier tests with a two-way ANOVA showed that the efficacy beliefs did not have a significant effect on any of the tested variables. Regression analysis also showed that the manipulation of efficacy beliefs could not be seen as a predictor of the perceived threat (β=.05, t(230)=.05, n. s.), the perceived efficacy (β=.10, t(230)=1.45, n. s.), information seeking (β= -.01, t(227)= -.08, n. s.) or protective behaviors (β=.06, t(227)=.92, n. s.). In the simple linear regression analysis, the manipulation of timing turned out to be a significant predictor of the perceived threat (β=.17, t(230)=2.65, p<0.01) and information seeking (β=.14, t(227)=2.09, p=0.04) with timing explaining a higher percentage of variance in the perceived threat (R^2=.03, F(1,231)=7.00, p=0.01) than in information seeking (R^2=.02, F(1,228)=4.36, p=0.04). However, the timing turned out to be not a predictor of the perceived efficacy (β= -.01, t(230)= -.13, n. s.) or protective behaviors (β= -.01, t(227)= -.15, n. s.). This result is consistent with the results found in the two-way ANOVA in which the timing influenced the perceived threat and information seeking but did not influence the perceived efficacy. Results of the simple linear regression analysis concerning the timing and its influence on information seeking and self-protective behavior are shown in figure 1.

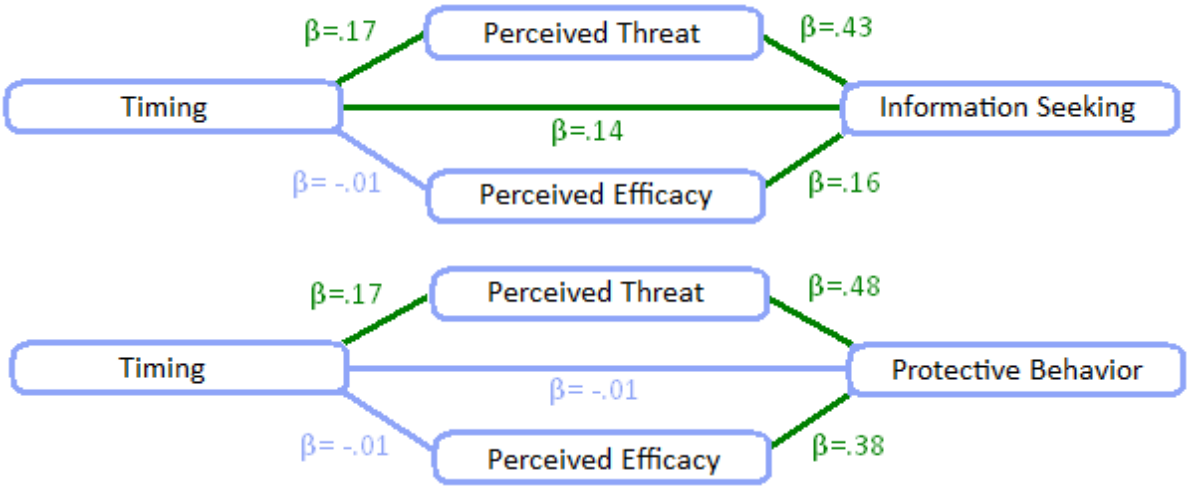

Figure 1: Results of a simple linear regression analysis with the manipulation of timing as the predictor (green lines indicate significant regression)

Figure 1 shows indirect relations between the timing and the dependent variables via the perceived threat. Therefore, a Sobel test was performed to test if the perceived threat mediated the relation between the timing and dependent variables. This analysis showed that the perceived threat mediates the relation between the timing and information seeking (Z=2.49, p=.01) and between the timing and self-protective behaviors (Z=2.52, p=.01.).

Additional analysis

Results show that information seeking can be seen as a significant predictor (β=.60, t(227)=11.36, p<0.01) of self-protective behaviors explaining a large percentage of variance in self-protective behaviors (R^2=.36, F(1,228)=128.93, p<0.01). To test if the manipulation of efficacy beliefs interacts with information seeking, an additional analysis was performed. The variables efficacy beliefs and information seeking were centered and multiplied with each other into a new variable to measure the interaction. This analysis showed that there was no significant effect from the interaction between information seeking and efficacy beliefs (β= .06, t(225)=.54, n. s.) on self-protective behaviors.

Conclusions & Discussion

Based on the results, it is clear that the timing has a significant influence on information seeking and indirectly on self-protecting behavior whereas the manipulation of the efficacy beliefs does not have an influence on information seeking or self-protecting behavior at all. The findings concerning the timing seem to support the communication process as displayed in the CERC model from Reynolds and Seeger (2005) in which it is claimed that the post-crisis stage is important. The results also show one is not particularly likely to seek risk information concerning extreme weather. Still, the results show one is more likely to seek information concerning extreme weather in the post-crisis than in the pre-crisis stage.

The effectiveness of communicating in during the post-crisis stage

Respondents were asked how likely they were to seek similar information as shown in the risk message. Interestingly, respondents felt that they were more likely to seek post-crisis risk messages than pre-crisis risk messages which supported hypothesis 2a. In other words, communicating in the post-crisis stage would be more effective because more respondents tend to search information in the post-crisis stage than in the pre-crisis stage. Respondents were also asked how likely it was that they would take action to protect themselves. The timing of the risk message did not have an effect on the intention to engage in self-protective behaviors which rejects hypothesis 3a. However, this still means that both the pre-crisis stage and post-crisis stage are equally important in persuading one to engage in self-protective behaviors. The timing of the risk message also had a significant influence on the perceived threat. The perceived threat was higher in the post-crisis stage than in the pre-crisis stage which supported hypothesis 1a.

There are however some limitations. First, a simplified CERC model of the original CERC model from Reynolds and Seeger (2005) was tested. To further test the communication process as displayed in this model, all the five phases of the CERC model should be tested in the future. This will not be possible in the context of extreme weather but will be possible in the context of other crises. Second, the manipulation of timing was relatively small. The tone of voice was manipulated and specific consequences were added to the risk message. It is possible that the specific consequences were influencing the results more than the tone of voice. Future research should therefore test if giving general or specific consequences influences the perceived threat.

The effectiveness of telling one that he or she is able to perform tasks

The manipulation of the efficacy beliefs did not have a significant influence on the perceived threat, perceived efficacy, information seeking or intention to engage in self-protective behaviors. This rejects hypothesis 1b, 2b and 3b in which it was claimed that higher efficacy beliefs would lead to a significantly higher perceived efficacy, a higher level of information seeking, and a higher intention to engage in self-protective behaviors. It is in contrast with the results found in the study from Kievik and Gutteling (2010) but consistent with results found in the study from Van Leeuwen (2012). Interestingly, the manipulation of the efficacy beliefs does have a small and positive influence on the perceived efficacy and self-protective behaviors. However, these results were not significant which was also the case in the research from Van Leeuwen (2012).

To explain this result, it is necessary to look at the manipulation itself. It is possible that the manipulation of efficacy beliefs was not sufficient enough resulting in risk messages that were more similar than different. This might be due to the fact that the risk messages used were made as realistic as possible so that it was thinkable that similar messages could be used by KNMI. However, this resulted in less extreme differences between the manipulations. This means that more research is necessary to test an extreme manipulation of efficacy beliefs to test the mechanism of telling one that he or she is able to perform certain tasks has an effect on engaging in self-protective behaviors. This would than give a better understanding of the influence of telling one that he or she is able to perform certain tasks. In addition, it might be the case that there are also other variables influencing the perceived efficacy in the context of extreme weather than just telling one that he or she is able to perform certain tasks. To illustrate, Zaalberg et al. (2009) showed that victims of flood are more likely to engage in self-protective behaviors than non-victims because their perceived efficacy was higher. Prior experiences may influence the perceived efficacy. It is thus possible that one will not rely on an organization as KNMI but one will rely on own prior experiences.

Perceived threat and perceived efficacy as predictors of self-protective behaviors

Information seeking turned out to be e a significant predictor of engaging in self-protective behaviors. This supports hypothesis 4a and is consistent with research from Kievik and Gutteling (2010) and Van Leeuwen (2012). The higher the level of information seeking the higher the likeliness is that one will take self-protective measures. It was also tested if the manipulation of efficacy beliefs and information seeking interacted with each other and influenced self-protective behaviors. However, no interaction was found. As stated, this may be due to the fact that the manipulation of efficacy beliefs was not extreme enough. Future research should therefore test manipulations of efficacy which are more extreme and test the interaction with information seeking on self-protective behaviors.

The perceived threat and information seeking also turned out to be significant predictors of information seeking and self-protective behaviors in the simple linear aggression analysis. This supports hypothesis 4b and 4c and is consistent with research from Kievik and Gutteling (2010) and Van Leeuwen (2012). Interestingly, it was also tested how the timing could be seen as a predictor for the perceived threat, perceived efficacy, information seeking and self protective behavior. These results were consistent with the two-way ANOVA and showed that the timing can be seen as predictor of the perceived threat and information seeking but not for the self-protective behaviors. Interestingly, the perceived threat mediated the relation between the timing and information seeking and between the timing and self-protective behaviors. In other words, the higher the perceived threat the more likely one will be to seek information or take self-protective behaviors. A significant influence from the timing on the perceived threat will therefore also have a significant effect on information seeking and self-protective behaviors.

However, a multiple regression analysis showed that there was only one significant predictor for information seeking, namely the perceived threat. This is probably due to the fact that the timing and perceived efficacy only explain a relatively small amount of variance in self-protective behaviors. A multiple regression analysis concerning self-protective behaviors showed similar results as in the simple linear regression in which the perceived threat and perceived efficacy are both seen as significant predictors of self-protective behaviors. Results thus show that the perceived threat should

be high to seek information and the perceived threat and perceived efficacy should be both high to engage in self-protective behaviors. In other words, the perceived efficacy will play a significant role in engaging in self-protective behaviors which is also shown in other research concerning self-protective behaviors (Tay & Watson, 2002; Gore & Bracken, 2005; Smith et al., 2008; Kievik & Gutteling, 2010; Evans et al., 2011). Research should therefore further focus on how the perceived efficacy can be influenced and if the perceived efficacy also works as a mediator between the manipulation of efficacy beliefs and information seeking or self-protective behaviors.

Other opportunities for future research

There are also some other general limitations in this research which give opportunities for future research. First, the items used in this research are measuring the intention to seek information and the intention to engage in self-protective behaviors. But how does the intention translates into actual behavior? To illustrate, according to Reynolds (2011) one might react different on risk communication when he or she is in a life threatening situation. It would for example be possible that in the case of an extreme weather event with life threatening situations one reacts different on pre-crisis or post-crisis risk communication. Future research could therefore try to test the CERC model before and after a crisis to make a better comparison between the pre-crisis and post-crisis stage and actual behavior. Second, it is not clear how the type of weather influenced the perceived threat. It is possible that one will perceive certain types of weather different than others. It will be very interesting to find how the perceived threat or risk perception of certain types of weather is. After all, the perceived threat turned out to be a significant predictor of information seeking and self-protective behaviors. Possibilities for future research will later be discussed in the recommendations part. Third, the convenient sample used in this research is not a valid reflection of the Dutch society. Larger and international samples should be used to support the processes as displayed in the CERC model from Reynolds and Seeger (2005).

Implications and recommendations

This research supports the pre-crisis and post-crisis stages as given in the CERC model from Reynolds and Seeger (2005). For communication professionals this means that both stages are equally important when communicating about risks. In addition, this research showed that one is more likely to seek post-crisis risk information than pre-crisis risk information. This means that the post-crisis stage is an ideal moment to communicate about the consequences of risks and how risks can be reduced in the future. Communication professionals should therefore use this post-crisis stage to communicate about how the risk could be reduced in the future. Multiple linear regression analysis also showed that the perceived threat can be seen as a significant predictor of information seeking. If on perceived the threat of an event is high, he or she is more likely to seek information. Multiple linear regression analysis also showed that if the perceived threat and the perceived efficacy are both high one is more likely to engage in self-protective behaviors. Communication professionals should therefore always consider how the risk of certain events are perceived and try to influence the perceived threat if necessary. In addition, communication professionals should give efficacy information to increase the likeliness that one will engage in self-protective behaviors. After all, a high perceived efficacy will lead to self-protective behaviors.

Recommendations for KNMI

The first recommendation towards KNMI is to give more information about how one can take self-protective measures. To start, this can be done by giving more specific consequences of the expected extreme weather event so that each individual can evaluate what self-protective behaviors would fit his or her situation. Literature also showed that risk messages are less effective without efficacy information ((Tay & Watson, 2002; Gore & Bracken, 2005; Smith et al., 2008; Kievik & Gutteling, 2010; Evans et al., 2011). Giving more specific consequences or information about how one can take self-protective measures would thus be an important step in making the risk communication more effective. KNMI has always been reserved with giving advice of self-protective behaviors because they feel that there are certain providers like Rijkswaterstaat and ProRail who know more about the impact on the society from certain types of extreme weather. However, the weather warnings are given by KNMI and in order to increase their effectiveness, the warnings should say something about specific consequences or how one can take self-protective measures. This is especially important when an extreme weather event is seen as very threatening. After all, this research showed that the higher the perceived threat, the more likely one is to seek for information. The more likely one is to seek for information, the more likely one is to engage in self-protective behaviors.

The second recommendation for KNMI is to communicate in the post-crisis stage of an extreme weather event. This communication should give specific consequences of the occured extreme weather event and information about why warnings were given thus the situation. This research showed that one is more likely to search for post-crisis risk information than pre-crisis risk information. In other words, the stages after an extreme weather event are ideal in explaining specific consequences of certain types of weather. The risk message should be distributed within 24 hours after the extreme weather event. If there is any new information about how risks may be reduced in the future, it is important to also communicate this information within those 24 hours. The reason why it is important to communicate within 24 hours is because the momentum will otherwise disappear. Interestingly, communication in the post-crisis stage also shows a form social responsibility because it is explains why extreme weather warnings were given and what KNMI eventually measured.

The third recommendation for KNMI is to create a better understanding of the perceived threat or risk perception of certain types of weather. After a simple linear regression analysis, this research showed that the timing has a significant but weak relationship with the perceived threat. This suggests that there are other variables explaining the perceived threat of the type of weather. Because the perceived threat has a significant and strong relationship with information seeking and self-protective behaviors, it is recommended to find how certain types of weather are perceived. This is important because it will help to manage the effectiveness of risk communication. To illustrate, it might be the case that the Dutch public does not worry that much about snowfall. However, in some scenarios snowfall can be very dangerous. To illustrate, on November the 25th in 2005 heavy snowfall with sleet caused several roof collapses and a power shutdown from 60 hours in the eastern part of the country (KNMI, 2012d). If the Dutch public perceives the threat of snowfall low, the risk communication in the post-crisis stage in a similar dangerous situation should focus on creating a better understanding the risk. This would increase the perceived threat and thus information seeking behavior about the risk of snowfall. If necessary, efficacy information can also be given to motivate the Dutch public to engage in self-protective behaviors.

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Appendix A: The questionnaire

Introduction

Weerwaarschuwingen

Dit onderzoek wordt uitgevoerd door Stefan Aerts van de Universiteit Twente in samenwerking met het Koninklijk Nederlands Meteorologisch Instituut (KNMI). Het onderzoek richt zich op de berichtgeving van het KNMI. De antwoorden die u invult, worden anoniem verwerkt. Alvast bedankt voor uw medewerking!

In the case of risk message 1 and 2: Stelt u zich de volgende situatie voor: Het is lekker warm en aan het eind van de week wordt onweer verwacht. Op de website van het KNMI komt u het volgend bericht tegen.

In the case of risk message 3 and 4: Stelt u zich de volgende situatie voor: Zware onweersbuien trekken over Nederland heen aan het einde van een zwoele zomerdag. De volgende dag leest u op de website van het KNMI de volgende tekst.

→Fit risk message here ←

The perceived threat (1-6)

In het bericht dat u heeft gelezen, wordt gesproken over zware onweersbuien. Vul de volgende vragen in over dit type weer… Volledig Oneens - Volledig mee eens

1. Ik geloof dat het geschetste weertype ernstig is 1 2 3 4 5
2. Ik geloof dat het geschetste weertype ernstige negatieve gevolgen heeft 1 2 3 4 5
3. Ik geloof dat het geschetste weertype zeer schadelijk is 1 2 3 4 5
4. Ik ben kwetsbaar tijdens het geschetste weertype 1 2 3 4 5
5. Ik loop risico tijdens het geschetste weertype 1 2 3 4 5
6. De kans is groot dat ik schade oploop tijdens het geschetste weertype. 1 2 3 4 5

The perceived efficacy (1-6)

In het bericht dat u heeft gelezen, wordt ook gesproken over hoe u uzelf en anderen kunt beschermen. Vul de volgende vragen in over deze aanbevolen voorbereidingen...

Volledig Oneens - Volledig mee eens

1. Als ik de aanbevolen voorbereiding tref, loop ik minder risico. 1 2 3 4 5
2. Ik vind de aanbevolen voorbereidingen nuttig. 1 2 3 4 5
3. De aanbevolen voorbereidingen zijn effectief in het verlagen van het risico. 1 2 3 4 5
4. Ik ben in staat om de aanbevolen voorbereiding uit te voeren om te voorkomen dat ik risico loop. 1 2 3 4 5
5. Ik kan makkelijk de aanbevolen voorbereiding uitvoeren om te voorkomen dat ik risico loop. 1 2 3 4 5
6. Ik heb de vaardigheden om de aanbevolen voorbereiding uit te voeren om te voorkomen dat ik risico loop. 1 2 3 4 5

Information seeking (1-3) and self-protective behaviors (4-6)

Geef op basis het van het bericht aan hoe groot de kans is dat u bepaalde handelingen uitvoert.

Op basis van het gelezen bericht is de kans dat ik…	Zeer klein - Zeer groot
1. …soortgelijken berichten ga zoeken…	1 2 3 4 5
2. …informatie over gevaarlijk of extreem weer in de gaten houd…	1 2 3 4 5
3. …dat ik het laatste nieuwe hierover opzoek…	1 2 3 4 5
4. …mij voorbereid op zware onweersbuien…	1 2 3 4 5
5. ...voorzorgsmaatregelen neem...	1 2 3 4 5
6. …mij aan de adviezen van de autoriteiten houd…	1 2 3 4 5

Overall judgment (1-3)

Vul in hoe u over het gesproken bericht denkt...	Volledig Oneens - Volledig mee eens
1. Het bericht is geloofwaardig.	1 2 3 4 5
2. Het bericht is serieus.	1 2 3 4 5
3. Het bericht is nuttig	1 2 3 4 5

Mocht u een opmerking hebben over het of de vragen, dan u deze hieronder kwijt.

……

Demographic variables (1-3)

1. Wat is uw geslacht?	O Man	O Vrouw
2. In welk jaar bent u geboren?	……	
3. Hoogste genoten opleiding	O LBO	O WO
	O MBO	O Middelbare school
	O HBO	O Anders, namelijk….

Bedankt voor het meedoen aan dit onderzoek!

Appendix B: Risk messages

Risk message 1: Pre-crisis stage and low efficacy beliefs

Koninklijk Nederlands Meteorologisch Instituut
Ministerie van Infrastructuur en Milieu

Home | Over het KNMI | Agenda | Publicaties | Research | Datacentrum | Veelgestelde vragen | zoek

Home > Nieuwsoverzicht

Nieuws

Bliksem en zware onweersbuien

Onweer kan ontstaan in buienwolken waarin warme lucht opstijgt en koude lucht daalt. Deze wrijving van koude en warme lucht leidt dan tot elektrische ladingen die zichtbaar worden in de vorm van bliksem. Donder is het geluid dat door de ontlading ontstaat. Bliksem kan plaatsvinden in een wolk of tussen wolken, maar ook tussen de wolk en de grond. Dit wordt een blikseminslag genoemd.

Caravans in het water door zeer zware windstoten tijdens onweer (Bron: Rob Groenland, KNMI).

Gevolgen van zware onweersbuien
Een blikseminslag kan zeer gevaarlijk zijn. Jaarlijks worden in Nederland 1 tot 2 mensen dodelijk door de bliksem getroffen. Het risico op een blikseminslag is groter in het open veld, op of aan het water, langs metalen hekwerken, bij lichtpalen en in de buurt van (alleenstaande) hoge bomen. Onweersbuien gaan ook vaak gepaard met zeer zware windstoten, hagel en extreem veel regen in zeer korte tijd. De windstoten kunnen zorgen voor omvallende bomen en rondvliegend puin en objecten.

Hoe uzelf en anderen te beschermen
Door de tijd tussen bliksem en donder in seconden te tellen, kunt u afleiden hoe ver weg het onweer is (3 seconden staat voor 1 kilometer). Als de donderklap binnen 10 seconden na de bliksemontlading volgt, is het onweer gevaarlijk dicht bij u. Bij naderend onweer is binnenshuis de veiligste plaats. Veilig is ook een afgesloten auto, een metalen caravan of een boot met afgesloten metalen hut, omdat bij een blikseminslag de lading direct wordt afgevoerd. Zorg er wel voor dat de schuilplaats zich niet naast een boom bevindt die zou kunnen omvallen! Om te voorkomen dat door zware windstoten objecten rondvliegen, kunt u uw persoonlijk bezittingen zoals tuinmeubilair vastmaken en ervoor zorgen dat bijvoorbeeld uw dakpannen goed op het dak van uw huis liggen.

Het belangrijkste
Wat te allen tijde belangrijk blijft, is om de weersituatie goed te volgen via de media. Dit is belangrijk omdat er lokaal grote verschillen in het weer kunnen optreden. Op de website van het KNMI kunt u de onweersbuien volgen via de neerslagradar en de berichtgeving. Check dus regelmatig de website www.knmi.nl en stel eventueel uw reis of activiteit uit als zware onweersbuien worden verwacht.

Bliksem tussen wolk en grond; een blikseminslag (Bron: KNMI).

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Risk message 2: Pre-crisis and high efficacy beliefs

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Nieuws

Bliksem en zware onweersbuien

Onweer kan ontstaan in buienwolken waarin warme lucht opstijgt en koude lucht daalt. Deze wrijving van koude en warme lucht leidt dan tot elektrische ladingen die zichtbaar worden in de vorm van bliksem. Donder is het geluid dat door de ontlading ontstaat. Bliksem kan plaatsvinden in een wolk of tussen wolken, maar ook tussen de wolk en de grond. Dit wordt een blikseminslag genoemd.

Caravans in het water door zeer zware windstoten tijdens onweer (Bron: Rob Groenland, KNMI).

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Een blikseminslag kan zeer gevaarlijk zijn. Jaarlijks worden in Nederland 1 tot 2 mensen dodelijk door de bliksem getroffen. Het risico op een blikseminslag is groter in het open veld, op of aan het water, langs metalen hekwerken, bij lichtpalen en in de buurt van (alleenstaande) hoge bomen. Onweersbuien gaan ook vaak gepaard met zeer zware windstoten, hagel en extreem veel regen in zeer korte tijd. De windstoten kunnen zorgen voor omvallende bomen en rondvliegend puin en objecten.

Hoe uzelf en anderen te beschermen
Er zijn handelingen die u zelf eenvoudig kunt uitvoeren om uzelf en anderen te beschermen tegen zware onweersbuien. Door de tijd tussen bliksem en donder in seconden te tellen, kunt u afleiden hoe ver weg het onweer is (3 seconden staat voor 1 kilometer). Als de donderklap binnen 10 seconden na de bliksemontlading volgt, is het onweer gevaarlijk dicht bij u. Bij naderend onweer is binnenshuis de veiligste plaats. Veilig is ook een afgesloten auto, een metalen caravan of een boot met afgesloten metalen hut, omdat bij een blikseminslag de lading direct wordt afgevoerd. Zorg er wel voor dat de schuilplaats zich niet naast een boom bevindt die zou kunnen omvallen! Om te voorkomen dat door zware windstoten objecten rondvliegen, kunt u uw persoonlijk bezittingen zoals tuinmeubilair vastmaken en ervoor zorgen dat bijvoorbeeld uw dakpannen goed op het dak van uw huis liggen. Zo kunt u op een eenvoudig manier letsel bij uzelf en anderen voorkomen.

Het belangrijkste
Wat te allen tijde belangrijk blijft, is om de weersontwikkeling goed te volgen via de media. Dit is belangrijk omdat er lokaal grote verschillen in het weer kunnen optreden. Het volgen van de weersontwikkeling is zeer eenvoudig. Op de website van het KNMI kunt u de onweersbuien volgen via de neerslagradar en de berichtgeving. Check dus regelmatig de website www.knmi.nl en stel eventueel uw reis of activiteit uit als zware onweersbuien worden verwacht.

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Risk message 3: Post-crisis and low efficacy beliefs

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Nieuws

Overlast door windstoten tijdens onweer

Het KNMI gaf gister een weeralarm (code rood) uit in verband met zware onweersbuien die over het land trokken. De onweersbuien gingen gepaard met zeer zware windstoten. In Volkel in Noord-Brabant werd rond 18.00 uur een windstoot gemeten van 123 kilometer per uur. Daarna sloeg de bliksem op het meetstation in en konden er geen metingen meer gedaan worden. Gezien de schade zullen de windstoten lokaal hoger zijn geweest dan 125 kilometer per uur.

Windstoten tijdens het onweer van gister hebben in Vethuizen een ravage achter gelaten (Bron: Rob Groenland, KNMI).

Gevolgen van zware onweersbuien
Vooral in zuidoosten van het land heeft de wind veel schade veroorzaakt. Verschillende bomen zijn omgewaaid en er zijn meldingen van daken die van huizen zijn gewaaid. In Limburg raakten 10 mensen gewond door rondvliegende takken en dakpannen. Op een camping in Vethuizen in het oosten van Gelderland sleurde de wind verschillende caravans mee waarbij één dode viel en 9 mensen gewond raakte.

Hoe uzelf en anderen te beschermen
Of onweer gevaarlijk dichtbij is, kunt u opmaken uit de tijd tussen bliksem en donder. Als de donderklap binnen 10 seconden na de bliksemontlading volgt, is het onweer gevaarlijk dicht bij u. In de meeste gevallen biedt een stevig stenen gebouw of een auto voldoende bescherming tegen onweer of zeer zware windstoten. Als er geen stevig stenen gebouw of auto in de buurt is, kunt u het beste gehurkt in een greppel of kuil schuilen en uw hoofd bedekken met uw handen. Let er altijd op dat er geen bomen of andere voorwerpen op uw schuilplaats kunnen vallen! Daarnaast is het belangrijk om voor het slechte weer uit al uw losse objecten in uw eigen omgeving goed vast te zetten, omdat losvliegende objecten als tuinmeubilair en dakpannen zwaar letsel kunnen veroorzaken.

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