Risk- and crisis communication

A research of the effect of risk- and crisis communication on actual behaviour

Bachelor thesis
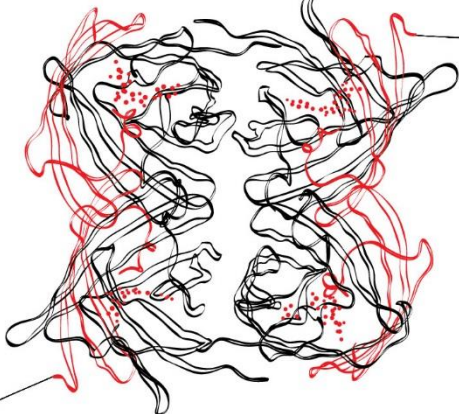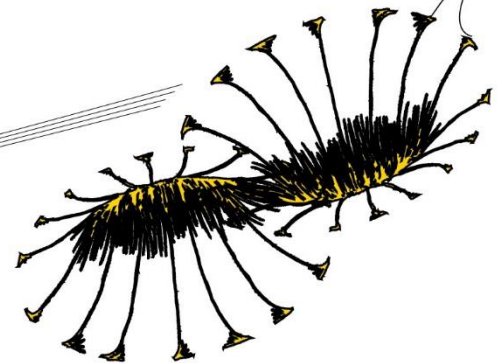
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Samenvatting

Dit onderzoek had als doel te onderzoeken welke invloed risico- en crisis communicatie heeft op risicoperceptie, self-efficacy, response efficacy en daadwerkelijk gedrag. De risicocommunicatie manipulatie bestond uit drie groepen: controle, risico communicatie bericht en risico communicatie bericht met een bijbehorend handelingsperspectief. Het crisiscommunicatie bericht bevatte in de ene conditie wel een handelingsperspectief en in de andere conditie niet. Verwacht werd, dat wanneer een handelingsperspectief werd gegeven bij beide vormen van communicatie, de deelnemers hoger zouden scoren op risicoperceptie, self-efficacy en response efficacy. Voor daadwerkelijk gedrag werd verwacht dat deelnemers de slachtoffers minder vaak zouden verplaatsen en meer met slachtoffers zouden praten wanneer een handelingsperspectief werd gegeven.

De onderzoeksgroep bestond uit 84 Nederlandssprekende studenten van Universiteit Twente. Het onderzoek maakte gebruik van een digitale vragenlijst om risicoperceptie, self-efficacy, response efficacy en informatie voldoening/tekortkoming te meten. Deelnemers werkten in een virtuele simulatie. In deze simulatie werd de crisiscommunicatie gemanipuleerd en het daadwerkelijke gedrag gemeten.

Voor crisiscommunicatie zijn een aantal significante effecten gevonden op het daadwerkelijke gedrag, namelijk op de eerste actie na crisiscommunicatie, 112 bellen en slachtoffers verplaatsen. Voor risicocommunicatie werd ook een significant effect gevonden op het verplaatsen van slachtoffers. Verdere significante effecten van beide communicatievormen op risicoperceptie, self-efficacy en response efficacy werden niet gevonden.

Summary

The current research examined how risk- and crisis communication influenced risk perception, self-efficacy, response efficacy and actual behavior. For the risk communication manipulation, the research sample was divided in three groups: control, risk communication message and risk communication message with action perspective. The crisis communication that was given either contained or did not contain an action perspective instructing participants to talk to victims and not move them. It was expected that when an action perspective was given, the risk perception, self-efficacy and response efficacy were higher. Actual behavior, namely moving victims was thought to be executed less when participants were told to talk to victims and not to move them. Similarly, it was expected that participants would talk more to victims.

The research group consisted of 84 Dutch speaking students at the University of Twente. The research used a digital questionnaire measuring risk perception, self-efficacy, response efficacy and information (in)sufficiency. Participants had to work in a virtual simulation where actual behaviour was measured. Crisis communication was manipulated during this simulation.

For actual behaviour, multiple significant effects were found. Significant effects were found for crisis communication on the first action after crisis communication, calling 112 and moving victims. There was also a significant main effect found for risk communication on moving victims. No significant effects were found for both communication forms on risk perception, self-efficacy and response efficacy.

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1 Introduction

1.1 Reason and Relevance

Crisis situations are becoming an everyday phenomenon. A fire could burn down a building, a flood disaster or a car accident could occur and endanger citizens, a hurricane could destroy entire villages, and many more disasters can come about. These crises can arise gradually or suddenly but the effects on communities or populations are always noticeable (Westlund & Ghersetti, 2015). Hence, it is crucial to act correctly during a crisis situation and inform the relevant parties. Emergency services are not the only party that needs to be instructed. Citizens could also be informed on what to do. The citizens are especially important to instruct because they are usually the first to arrive at these accident sites and can help save victims (Helsloot & Ruitenberg, 2004).

Helsloot and Ruitenberg (2004) argue that citizens in western societies act rational in disaster situations and make rational decisions about which actions to take. It would therefore be beneficial for citizens in a crisis situation to know what to do and inform them by giving adequate instructions. Adequate instructions can only be given with a better understanding of people's decisions and reactions during a crisis, as supported by Wardman's research (2014). Therefore, one aim of this research is to better understand people's decision making processes. When confronted with a crisis, citizens interpret the situation and they make a consideration about what to do (Griffin, Dunwoody & Neuwirth, 1999).

The thought process behind that consideration depends in part on what information citizens possess. Citizens have to take an active role and actively search for information, which leads to more effortful and systematic processing of that information (Kahlor, Dunwoody, Griffin & Neuwirth, 2006). According to Griffin et al. (1999), an active search for information is influenced by different factors. The interpretation of a situation depends on environment characteristics and present knowledge as well as experiences and related emotions. These factors influence the search for information and its interpretation which subsequently affects people's need for information. That need for information can be satisfied with effective communication. Effective communication is seen as a key condition to enable citizens to react adequately to a crisis situation (Vihalemm, Kiisel & Harro-Loit, 2012). Effective communication can therefore be seen as an important requirement for people to respond adequately to a crisis. One way to accomplish that communication is the use of risk- and crisis communication messages.

To prepare for a crisis, adequate instructions can be given by using risk communication to inform citizens of the risks and the handling of that risk, to help people cope with risks and to assure people about the government's capabilities in taking care of risks (Hampel, 2006). People's risk perception has to be taken into account for that particular form of communication because, as suggested by Burnside, Miller and Rivera (2007), effective information heightens risk perception and makes it more likely that the suggested behavior will actually be executed. During the crisis it is therefore important to use crisis communication to improve protective behavior and minimize negative consequences. The crisis communication message can be used to update citizens on the status of the accident, on what is being done and on what kind of actions they can undertake to help (Hampel, 2006).

Until this moment, most studies have focused on either risk communication or crisis communication and not the interaction between the two forms. However, Seeger (2006) argues that a merged approach can be used for more effective communication. It is essential to observe the interaction because both forms of communication cover different parts of information that citizens need and seek and because both serve a different function in the information process (Reynolds & Seeger, 2005).

The current research will therefore investigate the effects of both risk- and crisis communication and answer the question: what is the effect of risk and crisis communication on citizen's actual behavior? Firstly, multiple concepts have to be explained. A start will be made with an elaboration on the information- and decision making processes as well as on risk perception. After that the risk- and crisis communication and their respective goals will be explained. Lastly, the concept of actual behavior will be explained in terms of self-efficacy and response efficacy.

1.2 Theoretical Frame

1.2.1 Information processing.

To inform people adequately about risks and crisis, it is firstly important to understand what difficulties exist in good communication. The first challenge lies in getting people to actually start to prepare for disaster or crisis situations because they will only do this if they perceive the treat to be imminent (Helsloot & Ruitenberg, 2004). The second case that has to be considered is that people have to actively seek information about threats at a certain point. Giving information alone is not sufficient enough to prepare for a crisis. It is therefore crucial to know why people seek information at all.

Alaszewski (2005) and Ter Huurne & Gutteling (2008) state that people will actively seek information, when they have important decisions to make. This search for information is influenced by different factors: the individual's own scope of knowledge, the individual's social environment, engagement in the topic and the need to reduce uncertainty (Ter Huurne & Gutteling, 2008). For example, people that are dissatisfied with their knowledge will seek more actively than those who are satisfied with what they know.

Risk perception, which can be defined as the risk that is perceived by an individual or population, is also a strong predictor for the need to seek information and related to seeking information (Hampel, 2006; Kellens, Zaalberg & De Mayeyer, 2012; Kuttschreuter, 2006). A positive relation was found, which suggests that higher risk perception is related to a higher information need and thus also related to an increase in information seeking behaviour (Kellens et al., 2012). It has to be said however that people's judgements of risk is not only partially based on affective responses or emotional reactions as fear, but also on the provided information. That implies that risk perceptions can differ depending on the time and context.

1.2.2 Risk perception.

Risk perception, as stated before, signifies how risk is perceived by different individuals. It can also be defined as a subjective assessment where the chance on an accident, crisis or disaster is estimated and is decided how the consequences apply to us (Sjöberg, Moen & Rundmo, 2004). There are many other definitions. It is therefore no surprise that scientific perceptions of risk differ from the public's assessment of risk, although this does not mean that the public makes a less rational assessment (Hampel, 2006). This difference in

perception can pose problems when deciding on what kind of risk information has to be given to the public. This is important because the perception of an emergency situation can affect an individual's ability to manage a crisis (Yip et al., 2013). Moreover, risk perception is influenced by a number of factors. It can be lowered when the risk is understood but at the same time it can be heightened when effective information is given (Burnside et al., 2007; Hampel, 2006). Furthermore, as mentioned before, risk perception is a direct predictor of intentions on seeking information (Hampel, 2006; Kellens et al., 2012). Risk- and crisis communication messages could provide this effective information to positively influence people's risk perception. Before we can explore what exactly is important to convey in these risk- and crisis communication messages to positively influence risk perception, it is first necessary to understand what risk- and crisis communication actually is.

1.2.3 Risk - and crisis communication.

Two types of communication can be distinguished: risk- and crisis communication. Risk communication raises awareness to the nature, magnitude and significance of risks as well as the handling of these risks amongst all interested parties and before a crisis or risk presents itself (Hampel, 2006; Sheppard, Janoske, & Liu, 2012). The crisis communication message will become important during and after a certain crisis. Crisis communication focuses more on lessening negative outcomes after a threat or crisis. It is henceforth defined as a form of communication that "involves the sending and receiving of messages to prevent or lessen the negative outcomes of a crisis" (Coombs, 1999, p. 4; Reynolds & Seeger, 2005, p. 46). One difference between risk- and crisis communication as told above is thus the timing of the message: the risk communication message is sent before a crisis occurs; the crisis communication message during and after a crisis. Secondly, the focus of the message differs.

The goal and focus of a risk communication message is to inform the public about the threat, to sharpen their consciousness about threats and to persuade the change their behaviour to alleviate the threat (Reynolds & Seeger, 2005; Seeger, 2006). Crisis communication aims to explain the threat during and after it has happened and to identify likely consequences and outcomes. Certain similarities can be identified as well: both forms of communication aim to reduce harm for the involved parties through different but credible communication channels (Reynolds & Seeger, 2005). It is therefore essential that in these two-way communication processes the communication is optimal and effective (Sheppard et

al., 2012). It is thus necessary to have a good understanding of what risk- and crisis communication messages should entail.

Risk- and communication messages should contain high efficacy information and be framed positively to motivate citizens to actually perform the suggested behaviour (Witte & Allen, 2000; Gainforth & Latimer, 2011; Nan & Madden, 2012). High efficacy messages can create more defensive responses because people believe they can respond effectively to a threat, indicating that response efficacy and self-efficacy is heightened by high efficacy information (Witte & Allen, 2000). Kellens et al. (2012) support this notion by suggesting that when a persuasive message is given, response efficacy will be higher. Both self-efficacy and response efficacy are also related to seeking and using information as well as to risk perception (Rimal, 2001; McComas, 2006; Huurne & Gutteling, 2008). Both forms of efficacy will be further examined in relation to risk- and crisis communication messages because of their relations to information seeking, risk perception and intentions to actually act on the messages that were given.

1.2.4 Self-efficacy.

Self-efficacy can be defined as a person's belief or conviction that certain behaviour can be performed successfully by themselves (Bandura, 1977). Seeger (2006) argues that a crisis plan and therefore risk- and communication messages should provide self-efficacy information to be more effective because this gives people a certain control in a threatening situation. A message that contains a specific action is most recommended. In support of this statement, Davies, Terhorst, Nakonechny, Skukla and Saadawi (2014) found that when information was given on how to act, people's self-efficacy improved and they were better able to handle the risks. Similarly, Hilyard, Quin, Kim, Musa & Freimuth (2014) showed that when a cue to action is given, participants are more likely to follow up on that expected behaviour and that self-efficacy was a significant predictor for exhibiting the advised behaviour (Hilyard et al., 2014). Efficacy information could lead to greater intentions to follow the advice on the message and show protective behaviour (Heath, Lee & Ni, 2009; Verroen, Gutteling & De Vries, 2012).

1.2.5 Response efficacy.

Response efficacy can be defined as the perceived effectiveness of a certain action to alleviate a threat (Gainforth & Latimer, 2011). The response efficacy is seen as a predictive

variable for the use of the given information and as a strong predictor for information-seeking behaviour (Gainforth & Latimer, 2011; Kellens et al., 2012). When information-seeking behaviour is executed, the best available channel of information is sought (Yip et al., 2013). However, to help people decide what to do, just giving information is not enough. Response efficacy can have a strong effect on persuasive outcomes but therefore the information needs to be credible, be seen as effective and efficient for people to decide to act on it (White & Allen, 2000; Yip et al., 2013). The information needs a credible, effective and efficient action perspective so that people are confident that the threat can be effectively alleviated. Conclusively, it can be said that risk communication should focus on giving credible information, raising risk perception, and persuade with giving effective and efficient action perspectives to increase response efficacy and self-efficacy.

1.3 Present Study

The goal of the current study is to gain insight into the effects of the interaction between risk- and crisis communication on people's decision making processes during a crisis situation. The current research then, studies the effects of these two types of communication on citizen's actual behaviour, namely moving victims and talking to them. Effects on risk perception, self-efficacy and response efficacy are examined as well. The hypotheses pertaining to the research question "what is the effect of risk- and crisis communication on actual behaviour" will be featured below.

Hypotheses

1. People are more likely to get high scores on risk perception, self-efficacy and response efficacy, when risk communication with a course of action is presented than when no risk communication or only risk communication is available.

2. People who are presented with crisis communication and action perspectives are more likely to score higher on risk perception, self-efficacy and response efficacy than when only crisis communication is given.

3. The highest scores on risk perception, self-efficacy and response efficacy will be achieved when people are presented with both risk- and crisis communication with action perspectives.

4. When risk- and crisis communication messages contain an action perspective, less people will move victims and more people will talk to victims.

2. Method

The current research was a part of a larger research project. The method of the complete research was discussed. However, the focus of this research lay on specific constructs, namely the risk perception, self-efficacy and response efficacy.

2.1 Design

The current research had a 3 (risk communication) x 2 (crisis communication) between subjects design. For risk communication we used three conditions (Appendix 2). In the first condition participants read an article about traffic accidents with no course of action. In the second condition, participants read the same article about traffic accidents, but now with a course of action that victims should not be moved. In the control condition, participants read an article about Dutch people on holidays.

Crisis communication was manipulated by sending 2 different crisis communication messages. The first message stated that an accident had occurred on a bridge and that help was on the way. The second message also contained two recommended behaviours: talk to the victims and not move them.

A manipulation check was done for risk communication. After reading a text, participants had to answer two questions to control the effectiveness of the manipulation. In the control condition, 96,3% of the participants answered the questions correctly, indicating that the risk communication manipulation was effective. In the traffic accident condition with no course of action, 96,4% of the participants gave the correct answers. Lastly, in the condition with action perspective, 96,6% of the participants answered correctly.

2.2 Participants

For participation in the experiment, participants could either get credits or obtain 5 euros. There were two requirements for signing up: the participant had to be a student and had to be fluent in the Dutch language.

A total of 84 students participated in the current research. The sample consisted of 29 men and 55 women. Of all participants, 59 were Dutch and 25 were of German descent. The mean age was 21,77 years (*SD*=4,11).

The research sample was randomly distributed between the six conditions as described in Table 1. *N* in each condition varied between 11 and 17.

Table 1: *Participants Distributed between Risk- (Row) and Crisis Communication (Column) Manipulations*

	Without action perspective	With action perspective
Control condition	17	11
Risk awareness	14	14
Risk awareness and courses of action	11	17

2.3 Procedure

Participants were told to sit behind a laptop when they entered the experimental room. The instructions started with an informed consent (Appendix 1) and the explanation of the task. As a cover story, participants were told that they were in an application procedure. The research leader told the participants that the experiment existed of four parts: the first part of a digital questionnaire, training scenario, experimental scenario and lastly the second part of the questionnaire.

2.3.1 Questionnaire.

For the first part of the experiment, a questionnaire was introduced that included a memory task. Participants were asked to read a half page article carefully. The contents of this article differed in accordance to one of the risk communication conditions, which can be found in Appendix 2. As a part of the larger research project, questions about the participant's emotional state and pro-social personality were also asked. Approximately halfway through the questionnaire, a text appeared, that informed participants to give a signal to the researcher so that the next part of the experiment, the training scenario, could be started.

2.3.2 Training scenario.

In the training scenario, participants were entered into a virtual environment which was developed by TNO. In this virtual environment, participants were asked to help a virtual person finding a lost parcel. This scenario was used to let participants familiarise themselves

with the virtual environment of the experimental task. Participants learned how to move in the digital world, how to hold a conversation, how to pick up objects and how to use the telephone and its options. The realistic environment contained houses on each side of the road and the sound of birds to make it more lifelike.

The research leader instructed the participants to stop after the package had been collected and the phone had been used (this was checked by the research leader before exiting the training). The researcher would then start the experimental scenario, which will be explained in the upcoming paragraph. Participants were also warned that the program contained military photographs and settings because it was normally used to train soldiers. Therefore the scenario showed the character's health and sometimes a gun would appear (that could not be used).

2.4 Experimental Task

2.4.1 The scenario.

In the experimental scenario, participants had to follow a route to an application meeting. They were instructed to be at the meeting on time and to keep their clothes clean. The route led them to walk along a road until a bridge was reached. A car was standing in front of it. As the participant approached, the car moved forward. From the other side, a truck drove towards the car. A car horn could be heard before a loud crash followed. The screen changed and turned white for a second. The moment the screen returned to normal the car was on its side and the truck blocked the bridge. Both drivers were thrown out of their cars. One victim was visible and was lying in front of the car and was screaming in pain. The other victim was not visible and was lying behind the tilted car. At the start of the bridge, three bystanders stood still and observed the accident site passively. The participant could choose to interact with them. Another option was to use the mobile phone.

2.4.2 Reactions participants.

The participants could react to the accident in a few different ways. Participants had the possibility to communicate with bystanders and victims, and they had a (virtual) mobile phone. All options were pre-programmed and depending on the reaction of the participants, there would be a specific reaction from the virtual environment.

Bystanders could not take any action by themselves, but they were able to react on the behaviour and remarks of the participants. When participants asked bystanders to call the emergency services, the bystanders told that them they could not call, because they did not have a phone. When participants asked bystanders what to do, bystanders responded that someone needed to check whether there were victims and that someone had to call the emergency services. When participants walked away, they were approached by bystanders that they could not leave, because the victims needed help. When participants did nothing at all, bystanders commented that someone should do something.

The second option participants could choose, was to talk to the victims and/or move them. One of the victims did not react at all when spoken to. The other victim was screaming out and telling the participant that he was in pain. Lastly, the mobile phone could be used resulting in three different possibilities: call the emergency number, sent a tweet or check the risk information app.

It is important to note that the first minute after the accident, spontaneous behaviour was measured. Subsequently, the crisis communication was manipulated after that one minute. Participants received a message on their phone that the ambulance was on the way to the accident site. Participants in the second condition also got instructed to talk to the victims and not move them.

2.4.3 Conclusion.

The scenario ended with the arrival of the ambulance. That was exactly three minutes after the accident took place. A text message appeared stating that the scenario had finished and that the remaining part of the questionnaire could be filled in. The whole scenario took a total of seven minutes to complete.

2.4.4 Questionnaire.

When participants completed the experimental scenario, they were told to fill in the last part of the questionnaire which consisted of questions about the participant's emotional state, risk perception, self-efficacy, response efficacy, information (in)sufficiency, questions about social media and empathic abilities. The experiment ended with a debriefing.

2.5 Measures

2.5.1 Actual behaviour.

During the experimental scenario, actual behaviour was measured in a number of ways. The first action after the accident and the first action after crisis communication were logged to which there were eight different possible actions: contact first victim, contact second victim, call emergency number, contact a bystander, walk into wrong direction, sending tweet, check information app, move victim.

Furthermore, nine actions were logged before and after crisis communication took place: talking to first victim, talking to second victim, talking to bystanders and number of tweets; call emergencies (0=no; 1=yes); moving victims (0=no; 1=yes); movement pattern (0=wrong direction; 1=stay accident; 2=walk away some time after accident); information app (0=no; 1=yes).

2.5.2 Dependent variables.

The different constructs, namely risk perception, self-efficacy and response efficacy, were measured with a digital questionnaire on a 7 point Likert scale (1 = completely disagree; 7 = completely agree).

2.5.3 Risk perception.

Risk perception measured a person's awareness of risk and the severity of this risk. Risk perception questions were based on a selection of Slovic's (1987) and Gutteling and Wiegman's (1990) questions. The risk perception scale consisted of two subscales, namely risk awareness and affective responses. A six-item scale was used to assess risk awareness. ('There is a high risk on a road accident.'; I am aware that road accidents occur regularly.' The chance that a road accident will take place within my own environment is… (1=very little; 7=very high)'; 'A car accident has serious consequences.'; 'I am aware that a road accident can cause much damage.'; 'I am aware that a road accident leads to personal injuries.'; α = 0,71).

The second subscale, affective responses, consisted of 4 items ('I feel tense when thinking about a road accident.'; I feel fear when thinking about a road accident.'; I feel nervous when thinking about a road accident.'; I feel concerned when thinking about a road accident.'; α = 0,92).

2.5.4 Self-efficacy.

The concept self-efficacy, which can be defined as people's belief on being able to act adequately, was also measured. The questions selected were based on research from Lindell & Perry (1992) and Terpstra (2009). The scale consisted of 3 items ('I felt able to respond adequately to the accident.'; 'When the accident occurred, I was able to help.'; I knew what I had to do when the accident occurred.'; α = 0,72).

2.5.5 Response efficacy.

The response efficacy, which measured the effectivity of the reaction to alleviate a threat after an informative message has been given, was measured based on research from Lindell and Perry (1992) and Terpstra (2009). The scale consisted of 6 items ('It is important to call the emergency services.'; 'It is important to inform others about the accident.'; 'It is important to search for information about the best course of action.'; 'It is important to contact bystanders.'; 'It is important to talk to victims.'; 'It is important to not move the victims.'; α = 0,57).

2.5.6 General questions and demographics.

Participants reported how well they were able to empathize with the situation (scale: not at all – very much), their perceived computer skills (scale: not at all – very much) and how often they use social-media: Facebook, Twitter, text message/WhatsApp/Ping (scale: <1 a month – several times a day). In addition, participants reported their gender (male = 1, female = 2), age (in years), education (type) and nationality (Dutch = 1, German = 2, Other = 3).

3. Results

The independent variables, namely the risk communication and crisis communication, were measured using univariate analysis and chi-square. In every analysis a different dependent variable was measured.

3.1 Descriptive Statistics

Firstly, scores on general questions will be addressed. On the empathy scale, participants scored a mean of 4,89 (SD=1,36). The mean score on computer skills scale was set at 5,69 (SD=1,22). Furthermore, of the three categories of social media use, sms/WhatsApp/Ping scored the highest (M=6,75; SD=0,67), followed by Facebook (M=6,31; SD=1,30) and Twitter (M=1,93; SD=1,92).

Actual behaviour of the participants was measured in a number of ways both before and after crisis communication took place. The mean and standard deviation for every concept can be found in Table 2. The first actions after the accident and after crisis communication were measured as well. Most participants' first action was the same both directly after the accident and after crisis communication. 66,7% of the participants contacted the first victim directly after the accident and this percentage was 65,5% after crisis communication. Every participant stayed at the scene until the scenario ended.

The scores for the three other dependent variables were measured as well. Scores on response-efficacy were the highest (M=5,68; SD=0,69), followed by the scores on risk perception (M=4,93; SD=0,83). The participants had the lowest scores on the self-efficacy scale (M=4,42; SD=1,26).

Table 2: *Mean Scores and Standard Deviations for Actual Behaviour BEFORE and AFTER Crisis Communication*

Construct	Range	M	SD
Contact with the first victim BEFORE crisis communication	0-13[a]	2,71	1,97
Contact with the first victim AFTER crisis communication	0-36[a]	6,36	6,33
Contact with the second victim BEFORE crisis communication	0-2[a]	0,04	0,24
Contact with the second victim AFTER crisis communication	0-20[a]	1,26	3,30
Contact with bystanders BEFORE crisis communication	0-5[a]	0,37	1,14
Contact with bystanders AFTER crisis communication	0-20[a]	4,51	4,27
Tweets that have been sent BEFORE crisis communication	0[a]	0,00	0,00
Tweets that have been sent AFTER crisis communication	0-1[a]	0,05	0,21
Calling emergency number BEFORE crisis communication	0-1[b]	0,63	0,49
Calling emergency number AFTER crisis communication	0-1[b]	0,21	0,41
Moving victims BEFORE crisis communication	0-1[b]	0,10	0,30
Moving victims AFTER crisis communication	0-1[b]	0,25	0,44
Movement pattern BEFORE crisis communication	0-2[b]	1,00	0,00
Movement pattern AFTER crisis communication	0-2[b]	1,04	0,19
Checking the information app BEFORE crisis communication	0-1[b]	0,05	0,21
Checking the information app AFTER crisis communication	0-1[b]	0,29	0,45

Note. n = 84; a = count variable; b = nominal variable

3.2 Pearson's Correlation

Pearson's correlation coefficient was used to examine if the constructs showed reciprocal correlation and how strong that relation was (Table 3). Multiple significant correlations were found. Risk perception correlated positively with moving victims (r=0,23) and movement pattern (r=0,25). Self-efficacy was found to have a positive correlation to contact with first victim (r=0,27) and calling emergencies (r=0,27) but had a negative correlation to moving victims (r=-0,22). Furthermore, response efficacy was correlated negatively with contact with second victim (r=-0,31) as well as to moving victims (r=-0,26). Lastly, contacting bystanders showed a positive relation to checking the information app (r=0,34). However moving victims was correlated negatively with checking the information app (r=-0,24).

Table 3: *Pearson's Correlations*

	1	2	3	4	5	6	7	8	9	10	11
1 Risk perception	1										
2 Self-efficacy	-,21	1									
3 Response efficacy	,21	,12	1								
4 Contact first victim	-,13	,27*	,05	1							
5 Contact second victim	-,03	-,09	-,31**	-,05	1						
6 Contact bystanders	,01	-,05	,15	-,15	-,18	1					
7 Call emergencies	-,17	,27*	,17	,05	-,08	,11	1				
8 Moving victims	,23*	-,22*	-,26*	-,16	-,05	,07	-,15	1			
9 Number of tweets	-,10	,00	,16	,08	-,05	,02	,10	-,04	1		
10 Movement pattern	,25*	-,01	,04	-,06	-,08	,04	-,10	,11	-,04	1	
11 Information app	-,12	,05	,10	-,02	,02	,34**	,21	-,24*	,07	-,12	1

Note. N = 84; * p<0,05; ** p<0,01

3.3 Actual Behaviour

The means scores and standard deviations for the different variables of actual behaviour can be found in Table 4.

3.3.1 First action after accident.

No significant effects were found for risk communication on the first action after the accident took place ($X^2(6)=6,86$; $p=0,33$) and neither for crisis communication ($X^2(3)=3,12$; $p=0,37$).

3.3.2 First action after crisis communication.

For risk communication, the results showed no significant effects on the first action after crisis communication had taken place ($X^2(12)=18,76$; $p=0,09$). The effects of crisis communication however, were significant ($X^2(6)=13,43$; $p<0,05$).

3.3.3 Contact first victim.

Results for talking to the first victim, showed no significant main effects for risk communication ($F(2,78)=0,70$; $p=0,50$) or crisis communication ($F(1,78)=1,81$; $p=0,18$). The interaction effect was also not significant ($F(2,78)=0,50$; $p=0,61$).

3.3.4 Contact second victim.

For talking to the second victim, no significant main effects were found either for risk- ($F(2,78)=1,45$; $p=0,24$) or crisis communication ($F(1,78)=3,76$; $p=0,06$). The interaction effect for both forms of communication on talking to the second victim was also not significant ($F(2,78)=0,88$; $p=0,42$).

3.3.5 Contact bystanders.

No significant main effects were found for risk- ($F(2,78)=0,01$; $p=0,99$) and crisis communication ($F(1,78)=3,41$; $p=0,07$) before crisis communication took place. An interaction effect ($F(2,78)=0,58$; $p=0,56$) was not found either.

3.3.6 Call emergency number.

No significant effects could be found for risk communication ($X^2(2)=0,73$; $p=0,70$). For crisis communication however, a significant main effect was found ($X^2(1)=4,46$; $p<0,05$).

3.3.7 Move victims.

A significant main effect for risk communication was found ($X^2(4)=12,05$; $p<0,05$). For crisis communication the effect was also found to be significant ($X^2(2)=8,08$; $p<0,05$).

3.3.8 Number of Tweets.

No significant effects were found for risk- ($F(2,78)=1,834$; $p=0,17$) and crisis communication ($F(1,78)=0,835$; $p=0,36$) on the amount of tweets that had been sent. A significant interaction effect was also absent ($F(2,78)=0,214$; $p=0,81$).

3.3.9 Movement pattern.

For movement pattern, no significant effects were found for risk communication ($X^2(2)=2,07$; $p=0,36$) and crisis communication ($X^2(1)=0,346$; $p=0,56$).

3.3.10 Watch information app.

No significant effect was found for risk communication ($X^2(4)=8,97$; $p=0,06$). For crisis communication there was also no significant effect found ($X^2(2)=0,94$; $p=0,62$).

Table 4: *Mean Scores and Standard Deviations for Actual Behaviour for the Six Conditions*

Construct	Range	1 M (SD)	2 M (SD)	3 M (SD)	4 M (SD)	5 M (SD)	6 M (SD)
First action after accident	0-8[a]	1,71	1,55	1,79	1,57	1,64	1,53
		(1,16)	(0,93)	(1,12)	(0,94)	(1,12)	(1,01)
First action after crisis communication	0-8[a]	2,65	1,27	3,14	1,86	3,09	1,24
		(2,40)	(0,91)	(3,01)	(1,88)	(2,12)	(0,90)
Contact first victim	0-41[b]	9,06	11,00	7,79	8,00	7,18	11,00
		(5,29)	(10,71)	(3,83)	(4,71)	(4,60)	(8,67)
Contact second victim	0-20[b]	0,41	0,64	0,43	1,79	0,73	3,29
		(0,94)	(1,21)	(0,94)	(2,53)	(1,68)	(6,08)
Contact bystanders	0-20[b]	5,29	4,55	5,71	4,43	6,45	3,35
		(5,46)	(3,62)	(4,32)	(4,26)	(3,01)	(3,41)
Call emergency number	0-1[a]	0,41	0,41	0,50	0,39	0,50	0,35
		(0,20)	(0,20)	(0,00)	(0,21)	(0,00)	(0,23)
Move victims	0-1[a]	0,29	0,09	0,32	0,14	0,09	0,06
		(0,25)	(0,20)	(0,37)	(0,31)	(0,20)	(0,17)
Number of Tweets	0-1[b]	0,00	0,00	0,07	0,14	0,00	0,06
		(0,00)	(0,00)	(0,27)	(0,36)	(0,00)	(0,24)
Movement pattern	0-2[a]	1,00	1,09	1,04	1,00	1,00	1,00
		(0,00)	(0,20)	(0,13)	(0,00)	(0,00)	(0,00)
Check information app	0-1[a]	0,09	0,23	0,14	0,14	0,23	0,21
		(0,26)	(0,34)	(0,23)	(0,23)	(0,26)	(0,25)

Note. 1=control condition without action perspective (n=17); 2=control condition with action perspective (n=11); 3=risk awareness without action perspective (n=14); 4=risk awareness with action perspective (n=14) ; 5=risk awareness and courses of action without action perspective (n=11); 6=risk awareness and courses of action with action perspective (n=17); a=nominal variable; b=count variable

3.4 Risk Perception

For risk perception, no significant main effects were found for risk communication ($F(2,78)=0,43$; $p=0,65$) and crisis communication ($F(1,78)=0,31$; $p=0,58$). The interaction effect between both forms of communication on risk perception was also not significant ($F(2,78)=0,97$; $p=0,38$). The mean scores however, suggested that risk perception scores were higher in the control condition when an action perspective was given then when an action perspective was absent (Table 5). The same applied to the risk awareness with course of action condition although here differences were marginal. This was however not the case

in the risk awareness condition, where scores were higher if an action perspective was not given. These differences were nevertheless not found to be significant.

Table 5: *Means and Standard Deviations for Risk Perception*

Manipulation risk communication	Manipulation crisis communication			
	Without action perspective		With action perspective	
	n	*M (SD)*	*n*	*M (SD)*
Control	17	4,98 (0,59)	11	5,11 (1,07)
Risk awareness	14	5,06 (0,47)	14	4,60 (0,81)
Risk awareness and courses of action	11	4,93 (1,06)	17	4,95 (0,99)

3.5 Self- efficacy

For self-efficacy, no significant main effects were found for risk communication ($F(2,78)=1,57$; $p=0,21$) or crisis communication ($F(1,78)=0,06$; $p=0,81$). The interaction effect between risk- and crisis communication on self-efficacy was also not significant ($F(2,78)=0,02$; $p=0,98$). The mean scores suggested that scores were higher with action perspective than without across all risk communication manipulations. However, the differences in scores were not significant. The scores can be found in Table 6.

Table 6: *Means and Standard Deviations for Self-efficacy*

Manipulation risk communication	Manipulation crisis communication			
	Without action perspective		With action perspective	
	n	*M (SD)*	*n*	*M (SD)*
Control	17	4,67 (1,07)	11	4,70 (1,35)
Risk awareness	14	4,07 (1,37)	14	4,09 (1,36)
Risk awareness and courses of action	11	4,39 (1,18)	17	4,44 (1,34)

3.6 Response Efficacy

Main effects for risk communication ($F(2,78)=0,19$; $p=0,83$) and crisis communication ($F(1,78)=2,65$; $p=0,11$) were not significant. The interaction effect on response efficacy was also not significant ($F(2,78)=1,37$; $p=0,26$). Mean scores for participants that did not get an action perspective, seemed to be higher on response efficacy than when an action perspective

was actually given (Table 7). The scores, although no significant differences were found, also implied that when risk awareness and a course of action were given, the scores on response efficacy would be higher.

Table 7: *Means and Standard Deviations for Self-efficacy*

Manipulation risk communication	Manipulation crisis communication			
	Without action perspective		With action perspective	
	n	*M (SD)*	*n*	*M (SD)*
Control	17	5,73 (0,57)	11	5,68 (0,91)
Risk awareness	14	5,80 (0,66)	14	5,70 (0,59)
Risk awareness and courses of action	11	5,94 (0,83)	17	5,33 (0,64)

4. Discussion

The goal of the current study was to gain insight into the effects of the interaction between risk- and crisis communication on people's decision making processes during a crisis situation. The question on what the effect of risk and crisis communication on citizen's actual behavior was, will be addressed. The current research found no effects for risk- or crisis communication on risk perception, self-efficacy and response efficacy. However, some significant results were found for the effect of these two forms of communication on actual behaviour. The most important conclusions will be discussed below.

4.1 Conclusions

It was expected that scores on risk perception, self-efficacy and response efficacy would be highest when risk communication was provided with courses of action. This expectation was based on similar results that were found by Witte and Allen (2002) and Burnside et al. (2007). However, the current research found no significant effects to support this hypothesis. An explanation for this could have been that the risk communication was not manipulated correctly. The manipulation check however, showed that the control questions were answered correctly in almost all cases, indicating that the risk communication message was successfully transferred to the participants. A second possible explanation would be that the research sample consisted solely of students. Students are just one specific group within a population. Other results might have been found if the research group had been more general. Additionally, the number of participants was relatively small (only between 11 and 17 participants in each condition).

For the second hypothesis, it was expected that scores on risk perception, self-efficacy and response efficacy would be higher when crisis communication contained an action perspective than when it did not have this action perspective (Witte & Allen, 2002; Burnside et al., 2007; Davies et al., 2014). The results did not support this hypothesis. The reason for this could be that participants were not fully able to function in the computer simulation and therefore did not feel that they were able to act on the information or that it was efficient information to alleviate the threat. Participants themselves however, indicated that their computer skills were fairly good, which suggested that they should have been able to move and act freely in the simulation. Alternatively, the accident in the experimental scenario might not have made a real impact on participants. Participants were asked if they could

imagine themselves in that crisis situation. However, on the 7 point empathy scale they scored a mean score of 4,89 (*SD*=1,36), indicating that they could empathise with the situation to a certain extent. Though an aim could be to try and increase this mean by creating more realism so that people can empathise better with the situation. Perhaps it would also have been better to have a more drastic crisis to heighten the risk perception. If the risk perception was too low then participants could have been less motivated to act on the suggested behaviour. Now, participants had a mean score of 4,93 (*SD*=0,83) on a 7 point Likert scale. This risk perception score could be manipulated to be higher so that risk perception would be heightened and more people would be motivated to act on the given information. The risk should nevertheless remain realistic.

The third hypothesis gave an expectation on the interaction between risk and crisis communication. It was expected that the scores would be higher for risk perception, self-efficacy and response efficacy when an action perspective was given in both information messages (Witte & Allen, 2002; Burnside et al., 2007; Davies et al., 2014). No results were found to support this hypothesis. A reason could be that the simulation was not perceived as real enough. As mentioned before, participants generally indicated to be able to imagine themselves in the situation but the mean score of 4,93 (*SD*=0,83) lay only just above the neutral answer. This indicated that participants were only able to visualise themselves in that situation to a certain extent. If the threat was not perceived as real enough than perhaps their risk perception as well as their own belief to be able to act and alleviate the threat, were not really affected.

For the last hypothesis, it was expected that the actual behaviour would be influenced by the risk and crisis communication. Less people would move victims and more people would talk to victims when the risk and crisis communication messages contained action perspectives on not to move victims but talk to them instead. This hypothesis was based on results from Davies et al. (2014) and Hilyard et al. (2014) that when a cue to act was given, participants were more likely to act on expected behaviour. Similarly, this cue to action could have encouraged people to act (Heath et al., 2009); Gutteling & De Vries, 2012). The current research found no main or interaction effects of risk- and crisis communication on contacting the first victim and second victim respectively. There were however significant effects for risk- and crisis communication on moving the victims. The scores supported the hypothesis and showed that when risk communication with course of action and crisis communication and an action perspective were given, less people moved the victims than in any of the other

conditions (Table 4). The victims were moved less when an action perspective was given that they should not move victims. Contact with the victims however, did not differ as expected.

This could partly be because the second victim was very difficult to reach because he was trapped between a bridge and two fallen vehicles. Another reason could be that it was a very logical reaction to talk to the victims. Thus, participants that were not given an action perspective would have talked to the victims even if they were not instructed to do this. Results could also be influenced because, as mentioned before, it could be that the simulation was not perceived as real enough, which could explain why the participants' actions were different than expected. It could be that participants had trouble to connect actual crisis situations to the simulated accident on site. Their actions in moving victims might differ drastically when confronted with a real accident because of adrenaline or other influences. For talking to victims these differences would probably not have a big influence because, as mentioned before, it might be a very logical reaction to talk to victims. That would explain why significant results for moving victims could be found, but not for talking to victims. Furthermore, participants' actions could be influenced by the fact that the simulation only had limited options of movement. After a few minutes, participants might not have had any options left to explore and deviated from the advised behaviour until the scenario was finished.

4.2 Limitations and Follow-up Research

The current research was carefully implemented. It did however have a few limitations. One of the limitations was that the simulation could not fully replicate a real life situation. The digital surroundings were made as realistic as possible but a health bar would be visible in the left corner of the screen and sometimes a gun would appear as if it could be used in the scenario. It could therefore have appeared as a kind of video game. The images of soldiers and training missions that were displayed while loading the training and experimental scenario, might also have influenced participants. It must also be noted that the research was implemented with students as its research sample, which is not really a representation of the whole population. In addition, some of the students had a German nationality and while they could understand the Dutch questions in general, some interpretations might have been faulty. Furthermore, the number of participants in each condition was quite small because it varied between the 11 and 17 participants per condition. More participants would be advised for follow-up research.

Even though results did not support all the hypotheses, there was a new factor introduced in the current research: the interaction between risk- and crisis communication and its effect on actual behaviour. Follow-up research that implements the interaction between the two forms of communication could certainly prove to be interesting. A new simulation can be made using a more drastic crisis or accident to heighten the risk perception and to motivate people to act (Burnside et al., 2007). The health bar, weapon and military images could be left out. Also, more victims could be present at the accident site for participants to give aid to. They could be made more easily accessible for participants. Perhaps more options could be given to talk to the victims as well. In the current research, there were very limited options in talking to the two victims. One victim was completely silent and did not talk. The other victim was only able to exchange three sentences. Thus, participants could barely talk to the victims. To examine if the contact with the victims will differ, this should be changed for example through more victims and more conversation options. Conclusively it can be said, that as indicated by the results, an interaction between risk- and crisis communication and action perspective was more effective in facilitating actual behaviour, but only in certain aspects of behaviour such as moving victims. If an interaction between both forms of communication could also be proven to be effective in improving risk perception, self-efficacy and response efficacy, a new approach to risk and crisis management could be started to improve effective communication.

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Appendix 1: Informed consent

Dear participant,

Before starting the research, we would like to ask you to read the following information about the research itself, de confidentiality and the implementation of the results.

Participating in this research will give you more insight into the skills and characteristics of participants. The total research will take around 35 minutes. If you are participating in this research for credits, then fill in the SONA registration number (not student number) at the end of the research.

Before we use the received data for research goals, the results will be implemented confidentially and anonymously. Personal data will also be unavailable for third parties. It is possible to halt this research at any time without providing a reason, because participation is voluntary. If any questions arise during the research, you are allowed to ask them to the researcher.

For further information you can contact: Marije Bakker
(m.h.bakker@utwente.nl)

I have read the information carefully and agree that my data can be used for scientific research:
○ Yes
○ No

Appendix 2: Manipulation risk communication

Manipulation Risk Communication: Control

Read the text below calmly and carefully. After reading the text we will start the memory task by asking two questions about the text.

The Dutch on vacation

It is difficult for the Dutch to relinquish their vacation. Vacation is considered to be very important. TNS-NIPO registers the Dutch population's vacation plans but this only encompasses the one-week or longer vacations during the summer period. In practice it appears that, despite the circumstances in the economy, the Dutch population massively departs to vacation. However, they saved money by taking shorter vacations or by shortening the distance to their vacation.

About 12.5 million people leave for the holidays every year. 52% of these people use their car as form of transport. Furthermore, 36% travelled by plane and almost 10% travelled by bus. Conclusively, Germany holds the number one spot of most visited foreign countries for vacation destinations.

How many people per year take a vacation?

○ 5 million

○ 7.5 million

○ 12.5 million

○ 15 million

Which country holds the number one spot of most visited foreign countries for vacation destinations?

○ Germany

○ Indonesia

○ America

○ Norway

Manipulation Risk Communication: Risk Awareness

Read the text below calmly and carefully. After reading the text we will start the memory task by asking two questions about the text.

Road accidents

It is difficult to depict how many road accidents occur in the Netherlands every year. The police register the road accidents in the Netherlands but no registration occurs when the police are not warned. In practice it appears that accident registration mostly depends on the severity of the accident. The severity of the accident is assessed by counting the amount of people with injuries and observing the kind of injuries they obtained.

Road accidents are the cause of about 840.000 injuries per year. Medical attention by a doctor was needed in 20% of these cases. Furthermore, 15% was treated in the trauma centre and almost 5% was admitted to the hospital. Conclusively, about 650 people died because of a road accident.

How many injuries are sustained yearly because of a road accident?

○ 100.000

○ 360.000

○ 840.000

○1.000.000

What causes or aggravates injuries when an accident has taken place?

○ Moving the victims

○ Helping the victim at the location you found him/her

○ Leaving the victim lying down

○ This was not written in the text.

Manipulation Risk Communication: Risk Awareness and Courses of Action

Read the text below calmly and carefully. After reading the text we will start the memory task by asking two questions about the text.

<u>Road accidents</u>

It is difficult to depict how many road accidents occur in the Netherlands every year. The police register the road accidents in the Netherlands but no registration occurs when the police are not warned. In practice it appears that accident registration mostly depends on the severity of the accident. The severity of the accident is assessed by counting the amount of people with injuries and observing the kind of injuries they obtained. Injuries can be brought on or aggravated when victims are moved.

Road accidents are the cause of about 840.000 injuries per year. Medical attention by a doctor was needed in 20% of these cases. Furthermore, 15% was treated in the trauma centre and almost 5% was admitted to the hospital. Conclusively, about 650 people died because of a road accident.

How many injuries are sustained yearly because of a road accident?

○ 100.000

○ 360.000

○ 840.000

○1.000.000

What causes or aggravates injuries when an accident has taken place?

○ Moving the victims

○ Helping the victim at the location you found him/her

○ Leaving the victim lying down

○ This was not written in the text.