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THE ROLE OF EMOTIONAL APPEALS IN RISK COMMUNICATION

Encouraging natural hazard preparedness with emotional-arousing messages

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ABSTRACT

Climate change increases the likelihood and intensity of natural hazards. People must be aware and ready for natural risks in their living area and learn how to protect themselves against them. However, people are usually not prepared to face natural hazards. Being unprepared can have dramatic consequences, sometimes being a matter of life and death. Hence, governments must communicate natural hazard preparedness and encourage their population to prepare. However, an important question remains: how can communication effectively influence preparedness behaviors?

This study explores the role of emotional appeals in risk communication regarding natural hazard preparedness. The thesis particularly focuses on the use of hope appeals. Indeed, most academic research has investigated fear appeal messages. If the latter are considered motivators for encouraging behaviors, hope appeals are also promising for motivating natural hazard preparedness. It is even more interesting to explore hope appeals when questioning if the government can send messages that induce fear in their population. Indeed, citizens may not accept a message that is framed negatively.

By means of an experimental survey, the study aims to explore whether hope appeals have comparable effects as fear appeals for encouraging natural hazard preparedness behaviors and whether both emotional appeals predict higher intentions to prepare compared to a neutral message. The results for both fear and hope appeals were inconclusive, meaning that the treatments did not increase preparedness intentions compared to the neutral message. However, the fear appeal was less accepted by the respondents than the other messages.

Keywords: natural hazards, risk communication, natural hazard preparedness, emotions, hope, fear appeals, behavior change

TABLE OF CONTENT

LIST OF TABLES AND FIGURES

1. INTRODUCTION

In 2022, natural disasters affected 185 million people and claimed the lives of 30.704 people worldwide (CRED, 2022). In addition to human losses, the costs of natural disaster consequences corresponded to US$ 223.8 in 2022 (CRED, 2022). These numbers reveal the extent of extreme weather events and their tragic repercussion on human lives. Unfortunately, the rapid increase in greenhouse emissions caused by human activities engenders global warming and is causing a multiplication of these natural disasters worldwide (Intergovernmental Panel On Climate Change (Ipcc), 2023). The IPCC report points out that human activities directly cause increasing heat waves, global sea level rise, heavy precipitations, floodings, and wildfires. The consequences of these events endanger ecosystems and, as seen above, humans (Intergovernmental Panel On Climate Change, 2023). Hence, individual and collective preparedness is essential to adapting to living in a world with increasing natural risks (United Nations Office for Disaster Risk Reduction, 2023). In the context of climate change, it is imperative to encourage individual preparedness to reduce populations' vulnerability to natural disasters.

Individual natural hazard preparedness refers to all the behaviors that an individual can implement in their household to gather the resources to protect themselves in the event of a disaster. In this sense, preparedness, also known as self-protective behaviors, consists primarily of becoming aware of potential natural risks in one's living area, anticipating the consequences of these risks, and mitigating the consequences of a hazard.

However, people do not prepare too often to face natural disasters (Gregory, 1995; Joule et al., 2007). Even more paradoxically, even if they know the existence of a risk in their living area, they may still not be prepared (Gregory, 1995; Joule et al., 2007). Gregory (1995) explains individuals must cross an intolerance threshold to perform preparedness behaviors, which means individuals must perceive the natural hazard as sufficiently threatening to change their behaviors and decide to prepare for it. Nevertheless, the issue is that a hazard is, by definition, uncertain to occur. Indeed, why bother to prepare if the hazard's likelihood of happening is low? This uncertainty makes preparedness uninteresting for individuals: if people prepare, but the hazard never happens, preparedness is pointless. However, reasoning in such a way is risky because if a hazard does occur, people might suffer from the consequences. Hence, relying on the population's willingness to prepare for natural hazards is insufficient.

The question is how to convince people that being unprepared can lead to severe consequences, sometimes to the detriment of their lives. The answer is that governments take the lead in encouraging people to endorse the responsibility of being prepared.

To understand the context of natural hazard preparedness, it is necessary to overview the role of governments and public authorities in disaster risk management and natural hazard preparedness. Disaster risk management encompasses all policies that aim to reduce the population's vulnerability to risks. Since states are responsible for protecting their population (Luoma-aho & Canel, 2020), they are the primary actors in implementing risk management policies. This management is usually at the national level (and other sub-levels), but several international bodies also outline it. A notable example on the global level is the Sendai Framework[1], adopted by United Nations members in 2015. This framework provides guidelines for how signatory states should conduct disaster risk management to reduce the losses of lives caused by disasters. The main goal of the Sendai Framework is to:

> Prevent new and reduce existing disaster risk by implementing […] measures that prevent and reduce hazard exposure and vulnerability to disaster, increase preparedness for response and recovery, and thus strengthen resilience (United Nations Office for Disaster Risk Reduction, 2015, p12).

This quotation represents the overall goal of the Sendai Framework, which is to emphasize the role of prevention in decreasing the population's vulnerability to environmental risks. Another crucial guiding principle is that states primarily organize and manage disaster risk reduction (United Nations, 2015). It also demands that governments invest in public and private preparedness to adapt the structures to respond better in case a disaster occurs, including the resilience of individuals. Overall, the framework advocates for multi-disciplinary cooperation in managing risks, the governments and relevant national authorities being the core.

The valuable part of the Sendai Framework for this thesis is its emphasis on states' role in communicating risks to their population. Indeed, it insists on spreading knowledge and raising awareness in public about natural hazard preparedness "through campaigns, social media, and community mobilization, taking into account specific audiences and their needs"

[1] The Sendai Framework is not the only legal framework that outlines disaster risk management. The idea in the thesis is only to present one of them, to show the emphasis on communication in disaster risk management.

(United Nations Office for Disaster Risk Reduction, 2015, p15). Moreover, the Global Assessment on Disaster Risk Reduction Report (2022), created by the United Nations Office for Disaster Risk Reduction, also recalls the role of risk communication as crucial in disaster risk reduction and its role in reducing people's vulnerability to risks. Overall, a takeaway message of this overview of disaster risk management is that risk communication is essential for natural hazard preparedness and that governments must implement risk communication policies to protect their population from disasters' consequences.

Risk communication is the process by which several actors (i.e., governments) spread information on various risks and aim to influence people's risk perception (Bostrom et al., 2018). It is an essential feature of disaster risk management because spreading knowledge about risks efficiently reduces people's vulnerability to risks. Indeed, Frandsen and Johansen (2020) suggest that the public usually expects public officials and politicians to handle crises in addition to emergency infrastructures. It is even more critical when considering that people will rely on trust in the information communicated by public authorities for engaging in natural hazard preparedness if they have very little knowledge about the risks (Visschers & Siegrist, 2018). That is the reason why communication policies are an important tool that should be as efficient as possible to motivate people to prepare for natural hazards.

However, the remaining questions are how to spread information about natural hazards and how to influence people's preparedness behaviors through communication. Indeed, as seen above, people do not usually prepare for risks, even though they are aware of them. Numerous factors, such as environmental, societal, cultural, and psychological, can hinder people from preparing themselves (for a review, see Mishra & Mazumdar, 2015). Therefore, communication may not influence behaviors entirely on its own because of these other factors. However, it is an important tool for spreading information on natural hazards and encouraging preparedness.

Academic research has been dedicated to discovering communication approaches to enhance the influence of risk communication on individuals' behaviors. Among these potential communication approaches, adding emotional content to prevention messages has been widely researched. Indeed, emotions are usually considered motivators for behaviors (Lazarus, 1991). Emotional appeals are messages that aim to evoke and arouse a specific emotion, and this aroused emotion is supposed to influence the receiver's behaviors, such as fear appeals (Witte, 1995).

Adding emotions to communication messages has already been researched in various fields, such as public health (Seeger, 2006). However, research must fill two essential gaps in risk communication and natural hazard preparedness. The first is the minimal interest in positive emotions in informative messages influencing behaviors. Indeed, in the field of public health, fear-framed messages have been widely researched due to their potential to scare people and restrain them from risky behaviors (Tannenbaum et al., 2015). However, less interest has been given to positive emotions, such as hope (Chadwick, 2015; Nabi & Myrick, 2019). Fear appeals are considered good motivators for behavior changes (Tannenbaum et al., 2015), but hope appeals may have similar effects on preparedness behaviors, if not having better motivational effects than a negative emotion such as fear. The second gap is that most of the research on risk communication and the role of emotion does not focus specifically on natural hazards (unlike literature on public health, where it is more common).

Against this background, this thesis investigates the present research question (RQ):

RQ1: Do emotional appeals in risk messages, particularly fear and hope, influence people's intention to engage in natural hazard preparedness?

Moreover, it is questionable whether governments and public administrations can send fear-based messages and voluntarily induce feelings of fear in their population to influence their preparedness behaviors. If fear appeals are usually considered efficient for influencing behaviors (Tannenbaum et al., 2015), they may also backfire against governments if the population does not accept the message. Indeed, people may not appreciate that their government sends them messages that induce fear, and therefore, they may not accept and not follow preparedness recommendations. Therefore, hope appeals may be a promising option to avoid this. Since hope recalls a positive emotion, there are reasons to believe that people may accept the message better than a fear appeal. This question of acceptability[2] of emotional appeals in natural hazard preparedness has not been studied and is questioned in this thesis.

An additional research question is also investigated:

RQ2: Do people accept better a natural hazard preparedness message sent by governments if it is framed with a hope appeal, compared to a fear appeal?

[2] In this thesis, I will refer to acceptability instead of acceptance, because acceptability implies the potential of people accepting a message sent by their government, and not actual acceptance.

A survey experiment on flood preparedness was conducted to inform the gap in the literature and respond to the two research questions. The experiment was designed to compare the effects of a fear appeal and hope appeal to a neutral message on preparedness intentions and acceptability. The results were inconclusive concerning the first research question: the fear appeal did not influence preparedness intentions compared to the neutral message. Even more surprisingly, the hope appeal predicted lower intentions to prepare than the neutral message. However, the results for the second research question were significant: fear appeals were associated with lower message acceptability levels compared to hope appeals.

The thesis is structured as follows. Section 2 is dedicated to taking a step back in risk communication literature to describe the importance of risk communication in natural hazard preparedness and its connection with emotional appeal approaches. Section 3 then outlines the theoretical framework and presents the hypothesis. Section 4 describes the methods used to answer the research question, followed by Section 5, which details the results of the experiment. Finally, Section 6 is dedicated to discussing the study's results.

2. PREVIOUS RESEARCH

Risk communication is an essential element for protecting people from various natural risks. It can influence behaviors and effectively encourage people to be prepared for natural hazards (Ferrer & Curt, 2021; Monteil et al., 2022). To understand how important it is to improve risk communication, this section describes risk policy instruments and their role in natural hazard preparedness. Moreover, this section also details how emotional appeals have been researched to make risk communication on natural hazards more effective.

2.1 Risk communication as a policy instrument

Governments use various policy instruments to achieve their political goals. Vedung and Van der Doelen (1998) describe policy instruments as "the set of techniques by which governmental authorities wield their power in attempting to ensure support and effect or prevent social change" (p 21). These policy tools are diverse, such as regulatory, economic, and informational. Informational policies, which include risk communication, are interventional instruments through which the government informs the population, restrains people from acting in a certain way, and targets to change their behaviors (Vedung & Van der Doelen, 1998). The part of "influence on behaviors" concerning governmental communication policies raises normative questions. Vedung and Van der Doelen (1998) state that usually, information from the government does not solely aim to provide knowledge to people but goes beyond that by trying to influence people's behaviors. This can be perceived by citizens as manipulation and paternalistic because the government determines how people should behave instead of people deciding for themselves (Vedung & Van der Doelen, 1998). To avoid falling into pitfalls, it must be transparent that the recommended behaviors by the government in informational policies genuinely benefit individuals and society (Vedung & Van der Doelen, 1998).

The main objective of informational campaigns on natural hazard preparedness is to provide knowledge on behaviors to adopt to protect citizens from natural disasters. Thus, the issue of manipulation does not lie in the fact that governments decide and promote self-protective behaviors (because the goal of these behaviors is transparent: protecting the population from natural hazards) but more in the fact of using communication strategies (such as emotional appeals) to persuade people to adopt the behaviors. Indeed, communicating about natural hazard preparedness is well-intentioned because it aims to protect the

population. However, using fear appeals to make people afraid of a natural risk in order to make them engage in preparedness is much more a question of manipulation. If the people feel they are being manipulated and reject the message, the message on preparedness may not have the desired effect of encouraging natural hazard preparedness. Therefore, even if it seems clear that risk communication seeks to protect the population, governments must be careful when trying to influence their citizens' behaviors through communication strategies.

To put it in a nutshell, it is crucial to understand the context of risk communication and what questions must be raised when states and public administrations want to influence people's preparedness behaviors. Although encouraging people's preparedness is necessary for their protection, it does not mean this influence can be exerted in any way. Unfortunately, the topic of acceptability of emotional appeals has not been researched so far, even if it is a crucial question that governments need to address, to the condition that acceptability does influence natural hazard preparedness. That is the reason why research on risk communication must make space to question the use of communication tools for influencing behaviors, such as emotional appeals (and more specifically fear appeals), and their issue with message acceptability.

2.2 Risk communication and natural hazard preparedness

Communication is a process by which a sender conveys a message to a receiver through a channel to transmit specific information (Laswell, 1971). In the public sector, governmental agencies elaborate communication campaigns to provide information that aims to warrant citizen welfare (Luoma-aho & Canel, 2020). Risk communication is a subfield of public communication and is about informing people about risks, traditionally in the public health sector (Seeger, 2006). The research field has been extended to other types of risks the population faces, including natural hazards. However, the fields are tightly connected, and findings about risk communication in public health are usually applied to natural hazard communication.

Scientific literature traditionally tells the difference between communication that aims to raise awareness before a hazard occurs and communication used during a disaster. In this regard, risk communication is the communication process that spreads information on hazards before disasters occur, while crisis communication refers to the communication once the disaster exists (Reynolds & W. Seeger, 2005). While looking closer at the distinction, risk communication focuses on information about potential risks and persuading the public to

adopt protective behaviors (Reynolds & W. Seeger, 2005). On the contrary, crisis communication occurs only when a hazard has occurred and informs how to cope with the consequences of the disaster (Reynolds & W. Seeger, 2005). Therefore, this thesis will refer only to risk communication because the focus is on communication messages before a hazard.

Risk communication has two main objectives: providing general knowledge about risks (potential severity, frequency, and so forth) and recommending self-protective behaviors (see Bostrom et al., 2018; Reynolds & W. Seeger, 2005; Seeger, 2006). Therefore, risk communication is considered an essential asset in disaster risk management that can effectively protect the population from potential risks[3] (Ferrer & Curt, 2021; Monteil et al., 2022). Indeed, if individuals are adequately informed about the risks they may face and prepare to protect themselves, they can reduce their vulnerability. However, information is generally insufficient for people to engage in preparedness behaviors, and many individuals do not apply behaviors recommended in communication messages (Vedung & Van der Doelen, 1998).

Factors explaining why people may not prepare for natural hazards are numerous: individual and risk characteristics (Slovic, 1987), risk perception (Scovell et al., 2022), previous experience (Gregory, 1995; Wachinger et al., 2013), and various psychological social and cultural factors (for a review, see Mishra & Mazumdar, 2015). If these factors are generally not directly connected to communication, there are reasons to believe they influence how the message will be perceived and received. Moreover, the influence of a message about natural hazards on preparedness intentions depends partially on how people perceive the message, reflect, and react to it (Palenchar & Heath, 2002). For instance, humans are considered to have bounded rationality, meaning they rely on simple heuristics to make decisions (Kahneman, 2003; Simon, 1955). In this regard, risk communication can facilitate decision-making by giving cues and direct information on what to do in case of a natural hazard. Thus, because of these external factors and subjective perception of the message, communicating on preparedness is usually insufficient to convince people to adopt self-protective behaviors.

Therefore, communication strategies must go beyond arguing and informing to change behaviors (Joule et al., 2007) by finding ways to go beyond these factors that hinder

[3] To capture the importance of risk communication research in the policymaking field, some handbooks provide general knowledge and recommendations to policymakers about how to communicate risk, which speaks quite well about how important research in the field can be for policymakers (for instance, see Lundgren & McMakin, 2013).

preparedness. Research has focused on finding these ways to make risk communication messages more influential and persuade people to change their behaviors. Therefore, exploring techniques to facilitate the influence of the messages on behaviors has led to integrating the role of emotions in the risk communication research agenda.

2.3 Risk communication and emotions

Emotions are reactions elicited by something specific (Visschers & Siegrist, 2018). It is more narrow than core affect, the latter being the most basic feeling a person can experience, such as pleasure or displeasure (Russell & Barrett, 1999). Moreover, emotions are good candidates for framing risk messages, as they are motivators for behavior (Lazarus, 1991; Taufik & Venhoeven, 2019). For instance, when individuals consider engaging in a specific behavior, they imagine the emotions the behavior could provide them, positive or negative (called anticipated emotions) (Taufik & Venhoeven, 2019). Taufik and Venhoeven (2019), who refer to encouraging pro-environmental behaviors, explain that if the behavior can lead to pleasure, the person is likelier to do it. On the same line, the Affect-As-Cognitive-Feedback approach states that a one-time judgment can rely on momentary mood and thoughts, which can influence choices and have significant consequences in the long term (Lair et al., 2020). The affect heuristics also consider that people will use their feelings and affect as cues to make decisions (Raue & Scholl, 2018). For instance, Siegrist and Gutscher, (2008) suggest that communication must help people anticipate the negative emotional consequences natural disasters can have on them, which would encourage them to be prepared. Therefore, various approaches in the research field support the idea that emotions are of crucial importance in individual decision-making and behaviors.

That leads to the question of which emotions can lead to certain behaviors. The affect heuristic relies on feelings of goodness and badness and does not distinguish emotions with the same valence (Tompkins et al., 2018). However, some theories suggest it is essential to differentiate the effects of each emotion instead of doing a dichotomy between positive and negative emotions. For instance, the Appraisal-Tendency framework proposed by Lerner and Keltner (2000) considers that specific emotions lead to different appraisals and decisions, even if they are of the same valence. In this sense, instead of focusing on the valence of the emotions, the authors proposed that each emotion may have different influences on risk judgment. For instance, anger and fear do not have the same influence on risk perception despite being two negative emotions (Lerner & Keltner, 2001).

Therefore, since emotions are essential to decision-making and behavior change, it justifies using emotional appeals to influence people's behaviors in risk communication messages. In this regard, negative emotions are the most referred to when influencing people's behaviors through risk communication messages, especially with fear. These fear-based messages, also called fear appeals, usually describe a threat in a negative framing to scare people and encourage them to avoid the threat by adopting specific behaviors (Witte, 1995). Indeed, fear is an emotion that is characterized by the uncertainty of a threat (Lazarus, 1991). Therefore, a fear appeal relies on this uncertainty to emphasize the threat perception, and the message usually describes that if one does not follow the messages' instructions to avoid the threat, they risk facing dramatic consequences (Maddux & Rogers, 1983; Tannenbaum et al., 2015). Different theories about threat-based messages to influence behaviors have been advanced, such as the Extended Parallel Process Model (EPPM) (Witte, 1992) and the Protection Motivation Theory (Rogers, 1975). Each theory supports that fear-based messages that produce fear can change people's risk perception and motivate people to avoid the threat (Rogers, 1975; Witte, 1992). The initial model of the Protection Motivation Theory emphasizes the role of the noxiousness or severity of the threatened event, the probability of the occurrence of the event, and the efficacy-recommended coping response (Rogers, 1975). The Protection Motivation Theory and the EPPM describe how the threat message is processed and how people respond. Later, the Protection Motivation Theory was revised to include the self-efficacy variable proposed by Bandura (1977) in fear-based messages. Self-efficacy refers efficacy to one's ability to perform a behavior.

According to a meta-analysis, fear appeals positively influence attitudes, intentions, and behaviors to restrain people from hazardous situations (Tannenbaum et al., 2015). An example of fear appeals in the field of natural hazard preparedness is the study of Mulilis and Lippa (1990), who studied and observed that after being exposed to a fear-based message, people changed their behaviors to perform earthquake preparedness.

If fear appeals are effective in influencing people's behaviors, that is certainly the reason why fear appeals have been broadly studied. Thus, there has been much less consideration for other emotions, especially positive emotions (Nabi & Myrick, 2019). This omission in the research field is important to address in order to solve the normative question of whether governments should or should not induce negative emotions in their citizens to encourage natural hazard preparedness. Indeed, using positive emotions seems more

acceptable, only on the condition that emotional appeals with positive emotions effectively influence preparedness behaviors.

Among positive emotions, hope may be an interesting emotion for being an influential motivator for behaviors (Nabi & Myrick, 2019). Hope is a future-oriented emotion that motivates people toward a positive outcome in a desperate situation (Lazarus, 1999). Hope-based messages should be explored in risk communication, especially considering that hope can be aroused in a threatening situation if people know they can do something to avoid the threat. Nabi & Myrick (2019) have suggested that hope can increase the power of fear-based appeals to persuade people's behaviors in the field of public health prevention. They postulate that once fear is aroused after exposure to the message, self-efficacy is the primary motivator for predicting intention to behaviors, and hope can reinforce the influence of self-efficacy on behavior change. The conclusion drawn from Nabi and Myrick's work is that hope plays a role in fear-based messages by being positively associated with self-efficacy. To go even further, Chadwick (2015) proposes the elaboration of hope-appeals, which solely focus on evoking hope and not fear. Their study on climate change prevention identified several components of hope-evoking elements, the most important being future-oriented favorable opportunities for the person. Their results were somewhat promising, indicating that in the study, hope was not strongly associated with behavior change, but that the design of the study did not allow to find such connection. This implies that in different settings, hope may be a motivator for behavior change.

To conclude this overview of the previous research, risk communication is an important asset to encourage natural hazard preparedness by orienting people's decision-making. In the context of natural hazard preparedness, encouraging self-protective behaviors is very important, and using effective communication on preparedness is more than crucial. However, when risk communication messages are insufficient, some communication tools, such as emotional appeals, can ameliorate a message's influence on people's behaviors. Research has focused on adding emotions to risk communication. If much interest has been given to fear appeals, less has been to hope appeals, even though hope emotion may also efficiently influence people's behaviors. Moreover, the omission of exploring positive emotions in the field is important for the normative question when it comes to governments inducing negative emotions in their population. That is the reason why exploring hope appeals can be an interesting contribution to the field of risk communication.

3. THEORETICAL FRAMEWORK

As a brief reminder, this thesis investigates how emotional appeals, particularly fear and hope appeals, can influence people's intentions to engage in natural hazard preparedness. The focus is to highlight whether hope appeals can have similar effects as fear appeals on preparedness intentions. A secondary objective of the thesis is to question whether people accept a message from the government framed with an emotion to influence people's preparedness behaviors, especially if it is a negative emotion such as fear.

The following section describes the theoretical frameworks and the hypothesis outlining these research questions.

3.1 Effects of fear appeals on preparedness intentions

The Extended Parallel Process Model helps to analyze how people react to fear appeals and is particularly useful for this thesis. The model considers that after exposure to a fear-based message (which is an external stimulus), the receiver of the message will process and appraise the threat described in the message (Witte, 1995). If the receiver perceives the threat as low, they will not further process the message (Witte, 1995). Therefore, it suggests the threat must be perceived as severe enough for the receiver to process the information, which is to be taken into consideration when designing a threat-based message. In addition to the perception of the threat, perceived efficacy is the second item that makes people decide whether to protect themselves from the threat or not. Perceived efficacy refers to two elements: self-efficacy, which is described as behaviors that enable people to get away from the threat, and response efficacy, which is the perceived effectiveness of the behaviors for avoiding the threat (Witte, 1995). Therefore, following the message recommendations and engaging in self-protective behaviors depends on the subjective perception of the person exposed to the threat-based message, and this is why a message that arouses fear can influence this perception.

High perceived risk is associated with high perceived efficacy, leading the message receiver to engage in what is called the danger control process (Witte, 1995). In other words, the individual will be more motivated to protect themselves from the threat and is likelier to engage in protective behaviors because they perceive the threat to be high but think they can control it. The danger control process is desirable since people will likely change their attitudes, intentions, and behaviors to effectively respond to the threat (Witte, 1995).

However, a high perception of risk associated with a low perceived efficacy will lead the message receiver to engage in the fear control process (Witte, 1995). If the message receiver perceives the threat so high that there is no point in preparing to face it, they will likely not do anything to protect themselves. The fear control process is not a desirable outcome if the goal of the message is to encourage individuals to protect themselves from the threat. Considering this, the EPPM considers there is a critical point, which is the appraisal of self-efficacy, that will lead a person toward either the danger or the fear control process (Witte, 1995). Therefore, self-efficacy elements contained in a message are the determinants that lead the receiver in one path or another (Witte, 1995, Tannenbaum et al., 2015).

In line with this, some research suggests that adding action tendencies (or specific behaviors) to a message is more influential than just the threatening message alone (Ruiter et al., 2014). Indeed, people may be more motivated because they consider the behaviors effective to protect themselves from the threat (Gregory, 1995), and they may be confident in their ability to implement them (Witte, 1992). Moreover, describing behaviors to avoid the threat gives people a sense of control over the hazard (Seeger, 2006). However, if they consider the recommended actions useless or think they cannot implement them, they are unlikely to adopt the behaviors (Witte, 1992). Therefore, including elements of self-efficacy (description of behaviors a person can do) is more efficient because the person knows how to reduce the harmful consequences of a hazard (Seeger, 2006). As a result, there are reasons to believe that including elements to ensure people can cope with the risk can influence their will to change their behavior.

In the scope of this thesis, the self-efficacy elements are characterized by recommended behaviors a person can do to protect themselves from floods, described in the flood preparedness message. However, in this study, self-efficacy was only a safeguard to guarantee that people had higher intentions to prepare and did not constitute a manipulated component in the experiment.

Therefore, presenting respondents with a fear-based message associated with behavior recommendations should encourage people to move toward the danger control process and, in turn, increase their intentions to prepare for floods. Following the statements above, the first hypothesis is:

H1: Fear appeals increase intentions to prepare for flooding, compared to neutral messages.

3.2 Effects of hope appeals on preparedness intentions

Positive emotions have been suggested to compensate for the potential failure of fear appeals to make people engage in certain behaviors (Gregory, 1995) and make people accept the risk better (Visschers & Siegrist, 2018). Hope is a positive emotion oriented toward the future and gives a sense of one's ability to achieve a favorable outcome in reaction to a threat (Chadwick, 2015; Lazarus, 1999). Research on hope and risk communication finds that, to some extent, hope is positively correlated with behavioral intentions, in the case of the study, on sun safety (Nabi & Myrick, 2019). In one study on hope appeals and climate change prevention, hope appeals had significant results on the perceived effectiveness of the recommended behaviors but not on behavioral intentions (Chadwick, 2015). The author interprets this result as stemming from the absence of recommended behaviors in the experiment's hope-appeals design. Therefore, there are reasons to expect in this thesis's experiment that hope appeals, associated with self-efficacy messages, should increase intentions to prepare. Indeed, suppose people think they can handle the situation and perceive the recommended behaviors as efficient. In that case, there are reasons to believe they will be motivated to prepare for flooding.

As a result, the second hypothesis is:

H2: Hope appeals increase intentions to prepare for flooding, compared to neutral messages.

3.3 Effects of emotional appeals on message acceptability

In this thesis, acceptability refers to the potential acceptance of a natural hazard preparedness message send by governments to their citizens. Using emotional appeals for natural hazard preparedness, particularly with negative emotions, may backfire. Indeed, if people do not accept the message because of its framing that induces negative feelings, there are reasons to believe they will not follow the behaviors recommended in the message. According to McGuire (1985; cited in Bostrom et al., 2018), individuals process risk communication messages in four steps: exposure and attention, understanding and acceptance, evaluative reactions and behavioral tendencies, and behavioral responses. This four-step process shows how acceptability must be considered. Indeed, before expecting people to change their behaviors in line with the recommendations of the message, they first need to

accept the message. Therefore, governments need to consider that utilizing emotional appeals, especially fear appeals, may not be efficient in changing people's preparedness behaviors if they do not accept the message.

Since the topic of the acceptability of emotional appeals has not been investigated in past research, it is difficult to draw a theoretical framework to guide the hypotheses. However, it is reasonable to assume that people who receive a fear appeal may accept the message less than a neutral message because of the negative content. Indeed, people may not appreciate receiving a message from governments that could produce negative emotions and, in turn, are less likely to accept it. Therefore, the public may accept fear appeal less than a neutral message. On the same line, hope appeals are expected to produce a higher acceptability level than fear appeals because hope induces a positive feeling. Therefore, the hypotheses are the following:

H3: Fear appeals are less accepted compared to neutral messages

H4: Hope appeals are better accepted compared to fear appeals

4. METHODS

This fourth section describes how the study was designed to answer the research questions and hypotheses, as well as for the design of the material and procedure used to collect the data.

4.1 Research design

In the scope of this thesis, conducting a survey experiment was the most suitable method to answer the research questions. First, it perfectly fits the study's goals: exploring the causal relation between emotional appeals and intentions to prepare, and acceptability of the message. Second, natural hazard preparedness is about individual preparedness. This means that to measure preparedness intentions, meeting and questioning people directly about their intentions is necessary. This argument is the same for capturing people's feelings on the acceptability of emotional appeals. Finally, a survey experiment allows dividing the survey's respondents into groups to compare treatments.

In this experiment, I investigated the potential causal effects of fear and hope appeals on preparedness intentions and acceptability. Therefore, I have divided the study respondents

into two treatment groups: one was exposed to a fear appeal, and the other to a hope appeal. To compare and analyze if the treatments had a causal effect on preparedness intentions and acceptability, a third group, the control group, was exposed to a neutral message (which was supposed to evoke any particular emotions).

All groups had to read a message about flood preparedness. I chose this natural hazard because floods are among the most frequent natural hazards in Europe (European Commission, 2024). Since I expected most survey respondents to live in Europe, choosing this one compared to other disasters made sense because the flood scenario is more relatable for the respondents.

4.1.1. Main variables [4]

For the experiment, the independent variable was the exposure to emotional appeals (fear or hope). For this purpose, the respondents were randomly assigned to one of the three groups: two treatment groups and one control group. The two treatment groups received one of the manipulations: the exposure to either a fear-framed message or a hope-framed one. Therefore, in the following sections of the thesis, these two treatment groups are also called the "fear group" and "hope group". One control group received a neutral message to compare if the treatments increased preparedness intentions and affected acceptability differently than a non-emotional message. Therefore, the only manipulation that differed in the groups was the emotional framing of the flood preparedness message. Hence, all the respondents had to answer the same questions throughout the survey.

The first study's main dependent variable is the intentions to engage in flood preparedness, shortened "intentions to prepare". As explained in the theory section, it is important to note that only behavioral intentions were considered, not actual preparedness behaviors. A brief comment must clarify this choice. For practical reasons, measuring real behavioral changes after exposure to an experimental message was impossible. In fact, little research on natural hazard preparedness has measured actual behavior changes via a longitudinal study[5]. Although this procedure would have been ideal for measuring the effects of emotional appeals on natural hazard preparedness, it was not possible to do it in the scope

[4] This section only aims at describing the choices made for the main variables. For the description of how they were measured refer to section 4.2.2 (p27).

[5] To my knowledge, the only study know was conducted by Mulilis and Lippa (1990), about threat appeals messages and earthquake preparedness. They contacted households in a district in California and analyzed behavior changes five weeks after exposure to the message.

of this thesis. Nevertheless, there are good reasons to believe that only measuring the intentions to behave can provide insight into what could be actual behavioral changes. To support this idea, the theory of planned behavior states that people's behaviors are formed on attitudes and intentions (Ajzen, 1985) and that intentions are a good predictor for behaviors (Paton et al., 2005). The theory of planned behavior has been used to measure the intentions to engage in natural hazard preparedness behaviors (e.g. Vinnell et al., 2021). Therefore, I argue that measuring intentions can give insight into real behavior changes and is useful for exploring emotional appeals' effects on natural hazard preparedness.

Moreover, the second main dependent variable is acceptability. The aim is to explore whether the treatments had effects on people's acceptability of the emotional messages compared to neutral messages. I could not measure the acceptance, meaning that I would have needed to measure the acceptance of an actual message sent by a government. Yet, in the study, I could only ask if respondents would potentially accept a message similar to the one in the experiment if it was sent by their government. Therefore, it was an imaginary scenario, meaning the measurement was only on acceptability (in other words, the potential of acceptance).

Manipulation checks are aimed at analyzing whether the treatments had effects on other variables. The first one was a manipulation check, which aimed to check if emotional appeals influenced the level of self-reported emotions (fear and hope) after exposure to the treatment or control message was assessed, respectively the treatment "fear message" on levels of fear and the treatment "hope message" on levels of self-reported hope. Indeed, one of the main issues of the experiment is that fear and hope can be elicited independently from the framing of the message. For instance, even people reading the hope-frame message could have felt fear since the preparedness message describes a potential threat. Therefore, it was necessary to measure the effects of the treatments on the level of self-reported emotions and assess if the treatments were efficient in producing the emotions they were meant to produce. On the same line, I have also used self-reported emotions to analyze if they influenced respondents' intentions to prepare.

4.1.2 Additional variables[6]

The experiment featured two additional aimed at exploring if factors were influencing the results of the treatments. The first one was living in an area prone to flooding. Since the

[6] The results with the additional variables were added in the Appendix

experiment was not restricted to people living in a flood-prone area, respondents were asked in the survey to imagine that a flood could happen in their living area, even if it is not the case in reality. However, people actually living in a flood-prone area may have greater intentions to prepare because the described scenario of the experiment is close to what they experience in their own lives. Furthermore, while answering the survey, they may have relied more on their actual living situation than people who had to pretend for the survey. The second screening variable was a previous experience with floods. Indeed, I suggest that respondents who had already experienced a flood may have greater intentions to prepare than those who had not[7]. Indeed, the influence of previous experience on natural hazard preparedness is still uncertain; it is often suggested that people who have experienced a specific disaster will likely be more prepared in the future (Gregory, 1995; Wachinger et al., 2013). In addition, a survey investigating the role of emotions in natural hazard communication found that people who had a negative experience with a flood had higher levels of insecurity compared to the ones who had not experienced and underestimated the negative emotional impact of a natural disaster (Siegrist & Gutscher, 2008). Therefore, there might be a difference in the experiment results between those who have had a previous experience with a flood and those who did not.

4.1.3 Limitations

The design of the study came along with limitations. Firstly, respondents were not all concerned about flood risk. Therefore, the results cannot be generalized, and how people exposed to a risk may react to an emotional appeal. The sample was not representative in any case (due to how the data was collected, which is described further in the thesis), meaning that the external validity was low. Finally, a survey is generally exposed to an issue of social desirability: people respond to what the researcher expects them to respond (van de Mortel, 2008). Thus, there are reasons to believe that respondents reported higher intentions to prepare, especially those who were not concerned by the flood risk (because they would overestimate their intentions to prepare). However, if a survey experiment has limits, it was a well-suited method to answer the two research questions in this study.

4.2 Materials

[7] The influence of previous experience on natural hazard preparedness is uncertain. However, some research supports the idea it does influence it (for a literature review on factors influencing natural hazard preparedness, see Mishra & Mazumdar, 2015).

The following section presents how the study was designed and how the data was collected in order to answer the research questions.

4.2.1 Emotional appeals

The experimental treatments aimed at imitating a “flyer” or “brochure” (which is referred to as a “message” in the following sections) that a government could send to its population to spread information on floods. The messages resulted in two “treatment messages,” which were respectively a fear appeal, a hope appeal, and one neutral message (which was the control condition).

To describe the design of the messages more precisely, every item described is associated with a letter that refers to the legend of Figure 1. Figure 1 shows the neutral message, Figure 2 shows the fear appeal, and Figure 3 the hope appeal.

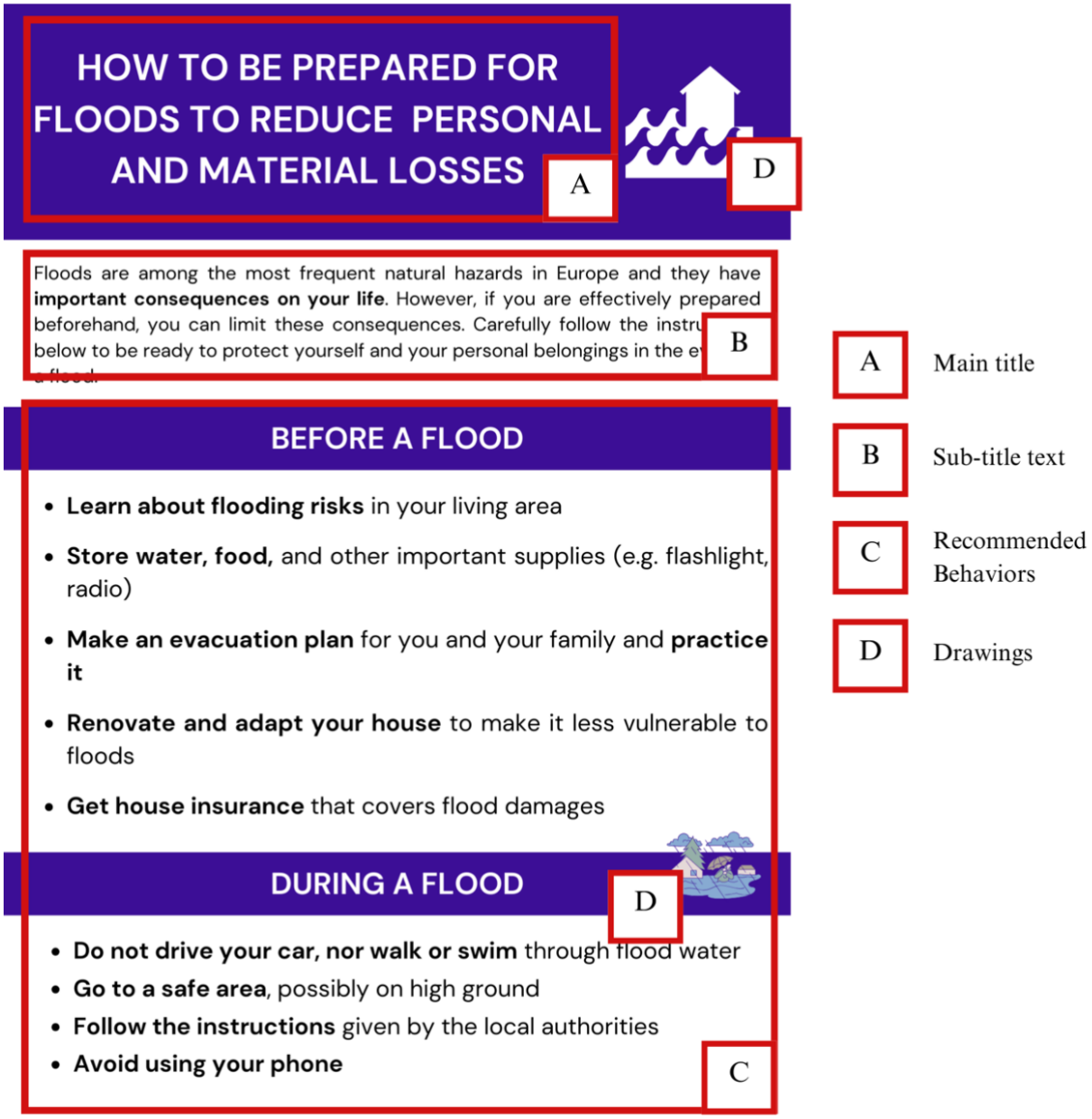

FIGURE 1: Neutral message designed for the experiment, with a legend of the elements of the message

YOU CAN LOSE YOUR HOME AND SUFFER SERIOUS DAMAGE IF YOU ARE NOT PREPARED FOR FLOODS!

Floods are among the most frequent natural hazards in Europe and can have **devastating consequences on your life.** However, if you are effectively prepared beforehand, you can limit these consequences. Carefully follow the instructions below to be ready to protect yourself and your personal belongings in the event of a flood.

BEFORE A FLOOD

- **Learn about flooding risks** in your living area
- **Store water, food,** and other important supplies (e.g. flashlight, radio).
- **Make an evacuation plan** for you and your family and **practice it**
- **Renovate and adapt your house** to make it less vulnerable to floods.
- **Get house insurance** that covers flood damages.

DURING A FLOOD

- **Do not drive your car, nor walk or swim** through flood water.
- **Go to a safe area**, possibly on high ground.
- **Follow the instructions** given by the local authorities.
- **Avoid using your phone**

FIGURE 2: Fear appeal designed for the experiment

YOU CAN PROTECT YOURSELF AND YOUR HOME IF YOU ARE WELL-PREPARED FOR FLOODS!

Floods are among the most frequent natural hazards in Europe and can have **consequences on your life.** However, if you are effectively prepared beforehand, you can limit these consequences. Carefully follow the instructions below to be ready to protect yourself and your personal belongings in the event of a flood.

BEFORE A FLOOD

- **Learn about flooding risks** in your living area
- **Store water, food,** and other important supplies (e.g. flashlight, radio).
- **Make an evacuation plan** for you and your family and **practice it**
- **Renovate and adapt your house** to make it less vulnerable to floods.
- **Get house insurance** that covers flood damages.

DURING A FLOOD

- **Do not drive your car, nor walk or swim** through flood water.
- **Go to a safe area**, possibly on high ground.
- **Follow the instructions** given by the local authorities.
- **Avoid using your phone**

FIGURE 3: Hope appeal designed for the experiment

Concerning the similarity between the messages, all had the same structure. The first item in the message was a large-sized title (A), supposedly the first element the respondents had read (because of its size). Then, a subtitle section (B) explained general information on floods and flood preparedness. Therefore, I have designed the subtitle text following the recommendations of Lundgren and McMakin (2013). They identify four aspects that the public seeks when risk communication is conveyed to them: description of the risk, risk consequences, level of control of the risk and its implications, and their exposure to the risk. It was impossible to describe the exposure to the risk in my messages because it was an imaginary scenario. Moreover, the messages included a list of preparedness behaviors (C) that individuals can implement against floods. The list was divided into two parts, describing the behaviors to do before and during a flood. The chosen behaviors were gathered from multiple sources, but mainly from the recommendations for flood preparedness of the French government (Géorisques, 2024) and the Federal Emergency Management Agency of the United States (Federal Emergency Management Agency, 2020).

The experimental manipulation consisted of changing different elements between the appeals to recall the emotions they were meant to arouse. For the “fear” condition, the title (A) was framed negatively and pessimistically; for the “hope” condition, the title was more encouraging. For the “neutral” condition, the title was neutral. Moreover, for the subtitle (B), the information, particularly the consequences of a flood, was described with a different vocabulary. For the fear message, the wording was “devastating consequences” to make the sentence “threatening” as possible. The hope message only referred to “consequences”; for the neutral condition, it was written “important consequences”. An adjective was added for the neutral message (“important”) and not for the hope appeal. I have made this choice because it is impossible to qualify the consequences of a flood positively. On the contrary, stating that the consequences are “important” means they exist but with emotionally neutral wording.

Thirdly, the messages had different colors for their background, which aligned with previous research. Indeed, research on emotions and colors seems weak and may be influenced by several things, such as personal color preferences (Valdez & Mehrabian, 1994). One study suggested that saturation and brightness were associated with more pleasantness, while dark colors were more related to negative emotions (Valdez & Mehrabian, 1994). However, the hue was weakly associated with emotions. Based on this finding, I have chosen to use a bright green for the hope message and black for the fear message. Although research

on color on emotion is somewhat unclear, the study above points toward choosing these colors. For the neutral flyer, I chose a blue-purple similar to the flyers used by the French government for flood preparedness[8].

In addition, I decided to add pictures only in the two treatment messages (fear and hope appeal) because pictures provoke more emotional arousal and influence risk perception (Xie et al., 2011) and, possibly, intentions to prepare. Therefore, the images used for the treatments had to be as close as possible to the emotions they were supposed to evoke. The control message had no picture to make it as neutral as possible. Lastly, small drawings (D) were added to the messages to give them more illustration (and make them look like real prevention messages).

4.2.2 Survey and measurements

The survey was designed to be as short as possible to increase the likelihood that respondents would answer all of it. Before beginning the survey, respondents were informed that no personal data were collected, and the responses were anonymous. The first items of the survey were questions about demographics and information about the respondents. Then, to ensure people felt concerned about flood risk, they had to imagine they were living in an area prone to floods. Then, they had to read one of the three messages and answer questions, including intentions to prepare and acceptability. The following section describes the measurements used in the survey[9].

Living area

The survey questioned whether people were living in a flood-prone area. The respondents had to choose between three options: “Yes,” “No,” and “Do not know/unsure.” If the respondents answered that they were concerned with a flood risk in their living area, they were displayed an additional question to assess the flood risk in their area via a 5-point Likert scale.

[8] For the example, see on https://www.georisques.gouv.fr/me-preparer-me-proteger/que-faire-en-cas-d-inondation

[9] The Appendix contains the whole survey and the survey flow for more details.

Previous experience

Respondents had to state whether they had previous experience or not. If they answered positively, they had to answer two additional questions about their house's damages and personal injury to assess the severity of the flood they had experienced.

Self-report of fear and hope

To assess whether the messages aroused hope and fear, respondents had to determine their level of emotions after exposure to the message, using a slide scale from 0 (=*not at all*) to 10 (=*a great deal*).

Intention to prepare for floods

The flood preparedness message included recommended preparedness behaviors, also used in the survey to measure the intention to prepare. After reading the messages, respondents had to rate their intentions to prepare among five selected preparedness behaviors recommended in the message. It was measured with a matrix question on a 5-point scale (from *extremely unlikely* = 1 to *extremely likely* = 5). An additional answer was possible ("I already do that" = 6). This answer aimed at removing these observations for the tests. Indeed, since the research question focuses on the intentions to engage in preparedness behaviors, it was impossible to save the observations of respondents who already performed the behaviors. To measure intentions to prepare, each of the five items, which were behaviors written in the message in the survey, were gathered to create an index. To verify the internal consistency of the variable "Intentions to prepare", a Cronbach's Alpha test was made, which supported that the five items efficiently measured the dependent variable "Intentions to prepare" ($\alpha = 0.83$).

Perceived efficacy

Perceived self-efficacy was analyzed using a matrix question with five points (*strongly disagree =1, strongly agree* = 5). Two items were analyzed: one focused on the perceived ability to prepare (self-efficacy) ("I am confident in my ability to prepare for a flood") and the second on the responses effectiveness of flood preparedness behaviors (response efficacy) ("Floods are too devastating anyway, so there is no point in preparing for them").

Acceptability

To measure the acceptability of the message if it was sent by a government, the answers ranged on a 5-point Likert scale, from *completely unacceptable* = 1 to *completely acceptable* =5.

Attention checks

The attention checks aimed to assess if the respondents carefully read the messages during the survey. Two questions about the information described in the messages were displayed to the respondents, indicating that people read the message.

4.3 Procedure

Participants were recruited through an online link spread on social media and contact channels (Instagram, Facebook, LinkedIn, WhatsApp, Messenger, and e-mail) as well as shared via Survey Circle. Survey Circle is a free online service that allows users to share their survey with others and get more answers by answering other people's surveys. Another recruitment technique was directly asking people to answer the survey by presenting them with a flyer with a QR code, leading directly to the survey when scanned. The data collection with the QR code occurred on different campuses of the University of Gothenburg, Chalmers University, and the University Lyon 2 Lumière (in France). Lastly, flyers with QR codes were placed on advertisement panels across different university campuses and left there. Everyone above eighteen was allowed to answer the survey.

4.4 Analytical techniques

The data treatments mainly consisted of linear regression analysis to respond to the research questions since the aim was to compare the two treatments with the control condition. The data analysis was done using the software STATA 18.

5. RESULTS

The fifth section describes the analyses of the results of the experiments.

5.1 Descriptive statistics

5.1.1 Sample refinement

After closing the survey to new responses, the number of responses received was 422. However, many observations had to be removed from the analysis, leading the sample to drop to 238 responses. Firstly, unfinished answers under the percentage threshold of 86% of survey completion were removed. This threshold was decided because it separated people who answered the preparedness intentions question from the ones who did not, which is one of the main dependent variables of the study. Moreover, people who failed attention checks were also removed. Besides, the most important observations to delete were all the observations for which the person answered that they already do or have done the recommended behaviors presented in the survey. Therefore, the experimental treatments could not affect these respondents' preparedness intentions. Therefore, the responses from these respondents had to be deleted.

5.1.2 Description of the sample[10]

The final sample constituted a majority of females (69.87%), students (65%) from Sweden (52%), who earn less than €999 (42%). 15.97% of the respondents declared to live in an area prone to floods, 60.50% answered negatively, and 23.53% did not know or were unsure about the flood risk in their living area. Moreover, the survey respondents were mainly unconcerned by a previous experience with flood (*N*=194, 81.17%). Among the respondents who stated they had already experienced a flood previously (*N*=45, 18.83%), the majority did not experience any house damage (53.33%) or only slightly (35.56%). No respondents declared they were injured during a flood. Table 1 shows an overview of the final sample and the group distribution. Table 2 describes each of the five items that measured intentions to prepare.

[10] Additional descriptive tables are located in the Appendix

TABLE 1: Demographic information of the sample, by group

	GROUPS							
	CONTROL		FEAR		HOPE		TOTAL	
	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent
GENDER								
Male	19	7.9%	18	7.5%	26	11%	63	26%
Female	62	26%	58	24%	47	20%	167	70%
Non-binary	3	1.3%	1	.42%	2	.84%	6	2.5%
Self-description					1	.42%	1	.42%
Prefer not to say			1	.42%	1	.42%	2	.84%
Total	84	35%	78	33%	77	32%	239	100%
COUNTRY								
Sweden	48	20%	37	15%	39	16%	124	52%
France	26	11%	30	13%	28	12%	84	35%
Other	10	4.2%	11	4.6%	10	4.2%	31	13%
Total	84	35%	78	33%	77	32%	239	100%
INCOME								
Less than €999€	35	15%	35	15%	29	12%	99	42%
€1000 - €1999	30	13%	25	11%	33	14%	88	37%
€2000 - €2999	9	3.8%	13	5.5%	12	5.1%	34	14%
€3000 - €3999	7	3%	2	.84%	2	.84%	11	4.6%
€4000- €4999	1	.42%	1	.42%			2	.84%
Over €5000	1	.42%	1	.42%	1	.42%	3	1.3%
Total	83	35%	77	32%	77	32%	237	100%
EMPLOYEMENT								
Employed	24	10%	17	7.1%	21	8.8%	62	26%
Unemployed	4	1.7%	2	.84%	1	.42%	7	2.9%
Self-employed	2	.84%	2	.84%	3	1.3%	7	2.9%
Student	51	21%	54	23%	50	21%	155	65%
Retired			2	.84%	1	.42%	3	1.3%
Other	3	1.3%	1	.42%	1	.42%	5	2.1%
Total	84	35%	78	33%	77	32%	239	100%

AGE	Obs.	Mean	SD	Min	Max
	228	27.26	9.65	18	82

TABLE 2: Description of the items "Intentions to prepare", by group

	GROUPS							
	CONTROL		FEAR		HOPE		TOTAL	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
"In the future, I intend to …								
… Learn more about flooding risks in my living area	3.68	.92	3.59	.90	3.28	1.26	3.52	1.05
… Store water, food, and other important supplies at my house	3.38	1.28	3.29	3.29	3.17	1.26	3.29	1.22
…Make an evacuation plan for myself and my family and practice it	2.94	1.26	2.68	1.18	2.57	1.21	2.73	1.26
…Get house insurance that covers flood damages	3.70	1.37	3.53	1.26	3.24	1.29	3.49	1.32
…Renovate and adapt my house to make it less vulnerable to floods	3.05	1.40	2.76	1.34	2.68	1.34	2.84	1.36

5.2 Manipulation checks

The following section describes the manipulation checks. The checks were made to test whether the manipulation (the emotional appeals) affected the emotions they were meant to produce. In other word, the fear appeal was expected to induce more fear in the respondents of the fear group compared to the respondents exposed to the other messages, and the hope appeal was expected to induce more hope in the respondents of the hope group compared to the respondents exposed to the other messages. Figures 4 and 5 represent the mean of respectively self-reported fear and hope by group. Figure 4 shows that fear appeal has the highest means concerning self-reported fear compared to the other conditions. From the figure, it seems to validate that fear appeal induced more feelings of fear compared to the other messages. However, in Figure 5, the means of the groups concerning self-reported hope are close to each other, showing that the hope appeal did not induce more hope to the respondents in the hope group than the other messages. To ensure these assumptions from the figures, which are not precise enough, regression analyses presented in the tables below show if the differences between the conditions are significant.

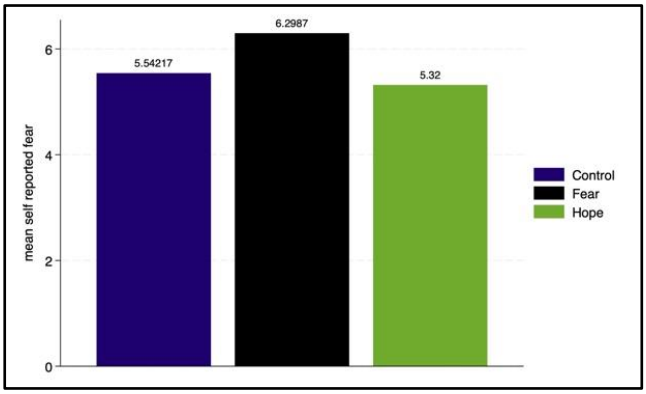

FIGURE 4: mean of self-reported fear, by group

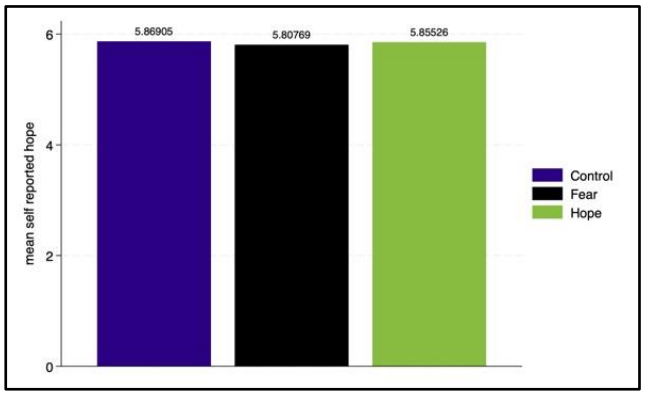

FIGURE 5: mean of self-reported hope, by group

Self-reported fear

This first regression analysis aimed at checking if the fear appeal induced more fear in respondents of the fear group, compared to the other messages conditions. Therefore, in Table 3, the base group is the fear group (since the fear appeal was supposed to induce more fear in the fear group compared to the other messages). The results show that respondents who received the fear appeal reported higher levels of fear compared to the respondents who received the hope appeal (*p<0.001*) and the neutral message (*p<.01*).

TABLE 3: Linear regression of emotional appeals on self-reported fear (base group: Fear)

emotion_fear	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
Group: base Fear	0	.	.	.	.	.
Control	-.757	.29	.2.61	.01***	-1.328	-.185
Hope	-.979	.297	-3.29	.001***	-1.564	-.393
Constant	6.299	.209	30.16	0	5.887	6.71

Mean dependent var	5.719	SD dependent var	1.871
R-squared	0.049	Number of obs	235

*** *p<.01*, ** *p<.05*, * *p<.1*

Self-reported hope

The linear regression reported in Table 4 was meant to elucidate if the hope message produced higher levels of hope in the hope group compared to the other conditions. The results show that respondents who received the hope message did not report more hope compared to the ones in the fear group (*p<.857*) and the control group (*p<.958*).

TABLE 4: Linear regression of emotions appeals on self-reported hope (base group: Hope)

emotion_hope	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Group: base Hope	0	.	.	.	.	.	
Control	.014	.259	0.05	.958	-.496	.523	
Fear	-.048	.263	-0.18	.857	-.566	.471	
Constant	5.855	.187	31.25	0***	5.486	6.224	

Mean dependent var	5.845	SD dependent var	1.627
R-squared	0.000	Number of obs	238

**** p<.01, ** p<.05, * p<.1*

Therefore, the results of the linear regressions show a significant relationship between the fear appeal condition and the level of self-reported fear, meaning that the fear appeal successfully induced more fear in the respondents of the fear group. However, the hope appeal did not show higher levels of hope in the respondents of the hope group compared to the other messages, meaning the hope message failed the manipulation check.

5.3 Effects of emotional appeals on intentions to prepare

This section presents the results answering the first research question on whether emotional appeals increase preparedness intentions. Figure 6 below represents the mean of intentions to prepare by group. At first sight from this figure, the respondents in the control group reported higher intentions to prepare, followed by the fear group and finally the hope group. However, it was necessary to analyze closer the difference of the means between the different groups with a linear regression.

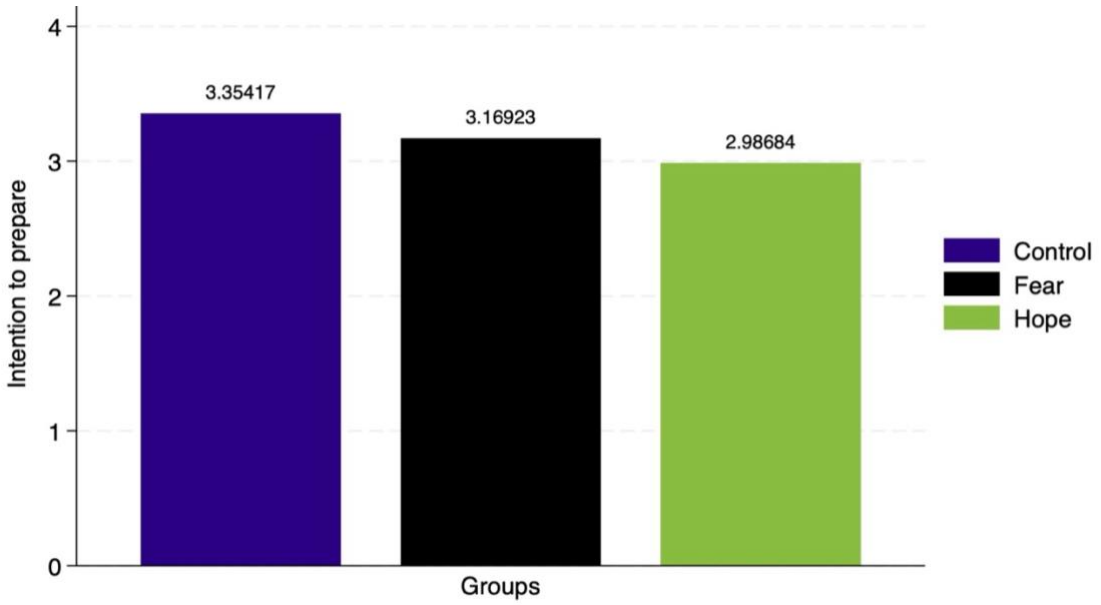

FIGURE 6: Mean of the five items measuring intention to prepare", by group

The regression analysis was made with the control group (neutral message) as the base group to compare the two treatment groups on their relationship with intentions to prepare. This regression aimed to answer the first research question, whether they positively affected intentions to prepare. The results of the regression analysis are in Table 5. The difference between the fear group (*M=3.17, SD=0.84*) and the control group (*M=3.35, SD=0.99*) was insignificant (*p<.221*), meaning that the fear appeal did not result in higher intentions to prepare compared to the neutral message. However, the expectations from hypothesis *H1* were that fear appeal would have increased intentions to behave. Therefore, *H1* must be rejected.

Moreover, respondents who received the hope appeal reported fewer intentions to follow the recommended behaviors in the message (*M=2.99, SD=1.03*) compared to the control group, which is a significant difference considering the results of the regression analysis (*p<.016*). However, the assumption of hypothesis *H2* was that hope appeal would induce higher intentions to prepare than the neutral message. The results show a different relationship: hope appeal resulted in fewer intentions to prepare compared to the neutral message. Therefore, hypothesis *H2* must also be rejected.

TABLE 5: Linear regression of emotional appeals on intentions to prepare

mean_intention	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]
group : base Control	0	.	.	.	.	.
Fear	-.185	.151	-1.23	.221	-.482	.112
Hope	-.367	.152	-2.42	.016**	-.666	-.069
Constant	3.354	.104	32.11	0***	3.148	3.56

Mean dependent var	3.176	SD dependent var	0.965
R-squared	0.024	Number of obs	238

*** *p<.01*, ** *p<.05*, * *p<.1*

In addition to the linear regression with the mean of the behavioral intention items, each item that measured preparedness intentions was also assessed individually with a regression analysis and compared by group to assess whether one item showed a different relation compared to the other items. However, the results from this additional regression analysis did not differ very much from the linear regression with the mean of all the items[11].

5.4 Effects of emotional appeals on acceptability

As a reminder, acceptability refers to questioning if respondents would accept governments sending them a message similar to the one in the survey to encourage natural hazard preparedness. Figure 7 represents the mean of the level of acceptability by group. According to Figure 7, the fear group shows less acceptability than the other groups. To assess the difference in the means of the groups more precisely, the results of the linear regression are detailed in Table 6.

[11] See in the Appendix

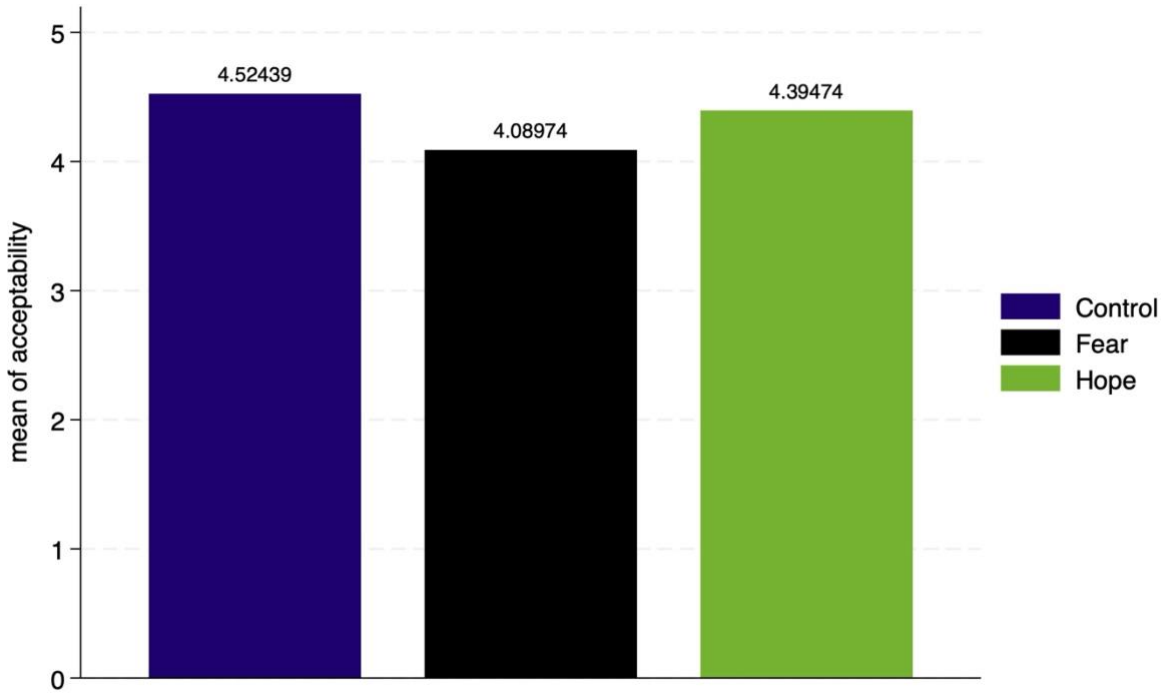

FIGURE 7: Mean of acceptability, by group

The linear regression consisted of analyzing if emotional appeals affected differently the level of acceptability of the message. For this linear regression, the base group has been set up as the fear group since the aim was to compare this group with the two other conditions.

In the first hypothesis *H3* on acceptability, it was assumed that the respondents in the fear appeal group would report lower levels of acceptability compared to the respondents in the control group. The results of the linear regression, detailed in Table 6, support the hypothesis. Indeed, respondents who received the fear appeal reported lower levels of acceptability compared to the ones who received the neutral message ($p<.003$). Therefore, hypothesis *H3* is accepted.

The second hypothesis *H4*, assumed that respondents in the hope appeal group would report higher levels of acceptability compared to the respondents in the fear appeal group. Considering the results of Table 6, respondents who received the fear message considered it the message to be less acceptable compared to the hope appeal ($p<0.038$). Therefore, hypothesis *H4* is accepted.

TABLE 6: Linear regression of emotional appeals on acceptability

acceptability	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
group : baseFear	0	.	.	.	.	.
Control	.435	.143	3.04	.003***	.153	.717
Hope	.305	.146	2.09	.038**	.017	.592
Constant	4.09	.103	39.90	0***	3.888	4.292
Mean dependent var		4.339	SD dependent var			0.920
R-squared		0.040	Number of obs			236

*** *p<.01, ** p<.05, * p<.1*

To conclude, hypotheses *H3* and *H4* predicted that the respondents in the fear appeal group would accept less of a fear appeal if it was sent by a government than the other groups, and the hypotheses were both supported by the results.

5.5 Effects of self-reported emotions on intentions to prepare

Additional tests were made to ensure that emotions are no better predictors than the messages for influencing behaviors. As a reminder, it was possible for people to feel fear and hope, independently from the message they had received. In other words, emotions were not necessarily associated with the message. Hence, it is interesting to test if self-reported emotions can predict intentions to prepare, aiming at exploring if emotions, independently from an emotional appeal, can influence intentions to prepare.

Self-reported fear

A linear regression was conducted to measure the relationship between self-reported fear and intentions to prepare. In Table 7, the test shows significant results (*p<.044),* thus the coefficient being weak (*coef=.068*). If the results have to be interpreted cautiously, it still shows that the more people felt fear, the more likely they were to have intentions to prepare.

TABLE 7: Linear regression of self-reported fear on intentions to prepare

mean_intention	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
emotion_fear	.068	.034	2.02	.044**	.002	.134
Constant	2.781	.202	13.76	0***	2.383	3.179

Mean dependent var	3.170	SD dependent var	0.968
R-squared	0.017	Number of obs	235

*** *p<.01, ** p<.05, * p<.1*

Self-reported hope

The following regression analysis aimed to analyze if self-reported hope predicted intentions to prepare. However, the results did not show any significant results (*p<.38*). Therefore, feelings of hope did not predict the intentions to prepare.

TABLE 8: Linear regression of self-reported hope on intentions to prepare

mean_intention	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
emotion_hope	.034	.039	0.88	.38	-.042	.11
Constant	2.978	.234	12.73	0***	2.517	3.439

Mean dependent var	3.176	SD dependent var	0.965
R-squared	0.003	Number of obs	238

*** p<.01, ** p<.05, * p<.1

Overall, only self-reported fear was positively correlated to intentions to prepare. However, these results must be interpreted carefully. Indeed, the results do not show a difference between the groups, meaning that the results are certainly influenced by at least the condition of the fear appeal.

6. DISCUSSION

This final section discusses the results of the different linear regressions and whether the results answer the research questions.

6.1 Interpretation of the results

The study's first research question was whether emotional appeals, such as fear and hope, positively influenced intentions for flood preparedness or not.

To begin with, the manipulation checks showed that the fear appeal successfully induced fear in its group compared to the other groups, but the hope appeal did not induce more hope compared to the other messages. However, the regression analysis gave inconclusive results for both treatments with the emotional appeals. These results mean that adding emotions to the message did not predict higher intentions to prepare for floods than the neutral message. These results were surprising. Indeed, fear appeals are generally supported to influence behaviors in the literature (Tannenbaum et al., 2015). Therefore, since the effects of the fear appeals did not influence intentions to prepare and contradict previous research, I assume this might be related to the study's design.

Even more surprisingly, the treatment group who received the hope appeal had fewer intentions to prepare than the control group. These results are difficult to interpret since they do not align with previous research on risk communication and hope appeals. As food for thought, I propose that people who received the hope appeal might have felt too optimistic and not aware enough of the dramatic consequences a flood can have. Respondents may have considered preparedness unnecessary because the threat of floods was not presented as severe in the hope appeal. Therefore, they may be less motivated to avoid the threat because they do not perceive it as important enough. To interpret better these results, it would have been interesting to investigate the risk perception with the survey and compare whether the risk perception was different in the hope and the fear appeal group compared to the control group. However, measuring risk perception in the present study here would not have been consistent with the design of the study because the risk presented in the survey’s message was fictitious, and it is not possible to measure risk perception on a false risk.

Overall, the conclusion from these results of the effects of emotional appeals on preparedness intentions shows that in the end, the neutral message might be preferable against

a fear or a hope appeal to influence preparedness intentions (even if, I recall, that fear appeals are usually considered to be efficient in changing behaviors (Tannenbaum et al., 2015)).

However, some results are intricate to explain. Indeed, the fear appeal group showed higher levels of self-reported fear than the control group. In addition, the regression analysis showed that higher levels of self-reported fear were positively correlated with increasing intentions to prepare. Yet, there were insignificant results in the regression between the intentions to prepare and the treatment messages, even if the fear message induced significantly higher levels of fear than the other two groups. Thus, in theory, there would have been a positive relation between the fear appeal and the intentions to prepare. Two options can explain these results: either there is a problem in the statistical model that I could not solve, or the sample is too small to draw a significant relationship, meaning there is a way to improve the study design. I also consider that it might be that people in other groups than the fear groups, may also have felt fear and therefore reported higher intentions to prepare. On the contrary, it is not because the fear message induced higher levels of fear that the respondents of the fear group had necessarily higher intentions to prepare compared to the other groups. The fear message was certainly not the only condition to induce fear, which might explain these results.

Moreover, the second research question was about whether citizens can more or less accept emotional appeals. Both hypotheses for this section stated that people who received the fear appeal would less accept the message than the hope and neutral messages. The results from the regression analysis supported these hypotheses, which is promising. It means that people may have considered the fear-based message too pessimistic or that it would produce too many negative feelings to be sent by a government to encourage flood preparedness. One conclusion given by the present study is that in designing a natural hazard preparedness message, it may be important to balance the effect of the fear-arousing elements by remembering that the receivers must accept the message. However, the relationship between acceptability and natural hazards is still to be investigated in research. Moreover, the results of the present study only rely on the assumption that acceptance of the preparedness message influences whether people follow the message's recommendations or not. If acceptance of the message is a condition for people to engage in natural hazard preparedness, there are good reasons to believe governments need to reflect on this point when designing a message on natural hazard preparedness and reconsidering the use of fear appeals.

6.2 Limitations of the study

There are some limitations to point out in the study. First, the item to measure the acceptability of the message was probably too restrictive to capture what people thought about acceptability. Indeed, respondents had to answer only one straightforward question about acceptability, which might be insufficient to measure it. However, I chose this option because the question was formulated to be clear enough for respondents to question their acceptability. Therefore, the reliability of the item "acceptability" in this study is questionable, thus being enough in the scope of this study.

Moreover, perceived efficacy items could have been used more effectively in the analyses. The initial idea was to measure if emotional appeals influence perceived efficacy and if perceived efficacy would also influence intentions to prepare. However, both items (self-efficacy and response efficacy) did not efficiently measure perceived efficacy. I contend that it was due to the manner in which the questions were formulated, especially for response efficacy, which did not measure the item efficiently. Therefore, I have added these tests to the appendix but left them on the side for the main analysis because they did not give interesting results to highlight the research questions.

Moreover, data collection is also a reason to interpret the results carefully. Firstly, the study was largely underpowered because of the sample size. Each group had between 77 and 83 respondents, far less than the 100 I initially targeted to compose each group. Secondly, the manner of collecting the data created a non-representative sample, even though this was expected before collecting the data. The collection was mostly on university campuses, resulting in an overrepresentation of young students. There is also gender imbalance, with an overrepresentation of females.

In addition, the manipulation of the treatment with the hope appeal did not induce hope in the respondents of the hope group compared to the other messages. This issue is intriguing and is probably the result of an issue in the design of the hope message.

Finally, all the regression models explained little variances, meaning that the tests were too weak to draw any reliable conclusions from all the results.

6.3 Conclusion

First things first, the results of the present thesis must be interpreted carefully since they do not align with previous research (especially for fear appeals on intentions to prepare) and the weakness of the models.

However, to conclude, the first research question was to question whether emotional appeals encouraged intentions to natural hazard preparedness. This thesis has shown that the emotional appeals did not induce more intentions to prepare than a neutral message in the experiment. Surprisingly, the hope appeal predicted lower intentions to prepare compared to the neutral message. Therefore, to avoid too much optimism and low perception of the threat, it could be interesting to investigate more hope by integrating it into the threat-based message since fear is an important motivator in encouraging people to avoid the threat, as suggested by Nabi and Myrick (2019). The idea is, therefore, to make the threat appear severe enough to make people want to avoid the threat, but at the same time, give them a sense of control by giving hopeful messages on their ability to cope with it.

Moreover, the second research question aimed at exploring if people accept a message about natural hazard preparedness sent by a government, whether it is hope-based or fear-based. The results showed less acceptability for the fear appeal, meaning that governments must question this when designing preparedness messages. Even if the results of the present study have to be assessed carefully, the question of acceptability deserves certainly to be explored in the research on risk communication and emotions, as well as the relation between natural hazard preparedness and message acceptance. Such research would also contribute to policymakers in the elaboration of informational campaigns on natural hazards to encourage preparedness.

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8. APPENDIX

8.1 Additional descriptive statistics

Table A: Living area

"To your knowledge, do you live in a flood-prone area?"	Freq.	Percent	Cum.
Yes	38	15.97	15.97
No	144	60.50	76.47
Do not know/unsure	56	23.53	100.00
Total	238	100.00	

Table B: Risk of flood in living area

How do you perceive the likelihood of flooding in your living area?	Freq.	Percent	Cum.
Extremely unlikely	2	5.26	5.26
Unlikely	7	18.42	23.68
Neither likely or unlikely	9	23.68	47.37
Likely	19	50.00	97.37
Extremely likely	1	2.63	100.00
Total	38	100.00	

Table C: Previous experience

Have you previously been affected by a flood?	Freq.	Percent	Cum.
Yes	45	18.83	18.83
No	194	81.17	100.00
Total	239	100.00	

Table D: House damage

Has your property been damaged because of flooding?	Freq.	Percent	Cum.
Not at all	24	53.33	53.33
Slightly	16	35.56	88.89
Moderately	4	8.89	97.78
Severely	1	2.22	100.00
Total	45	100.00	

Table E: Personal injury

Have you been personally injured because of flooding?	Freq.	Percent	Cum.
Not at all	45	100.00	100.00
Total	45	100.00	

Table F : Perceived efficacy

	group							
	Control		Fear		Hope		Total	
	Mean	Percent	Mean	Percent	Mean	Percent	Mean	Percent
"I am confident in my ability to prepare for a flood"								
Strongly disagree	3.33	2.53	3.6	2.11	3	1.27	3.36	5.91
Somewhat disagree	3.44	7.59	3.67	10.1	3.1	8.86	3.41	26.6
Neither agree nor disagree	3.82	9.28	3.22	9.7	3.12	7.17	3.4	26.2
Somewhat agree	3.84	15.6	3.91	9.7	3.45	12.2	3.73	37.6
Strongly agree	1	.422	3.33	1.27	3.6	2.11	3.22	3.8
Total	3.68	35.4	3.59	32.9	3.27	31.6	3.52	100
"Floods are too devastating anyway, so there is no point in preparing for them"								
Strongly disagree	3.72	15.2	3.86	12.2	3.54	11	3.71	38.4
Somewhat disagree	3.73	11	3.57	11.8	3.19	11	3.5	33.8
Neither agree nor disagree	3.27	4.64	2.92	5.49	3	5.49	3.05	15.6
Somewhat agree	3.7	4.22	3.86	2.95	3.4	4.22	3.63	11.4
Strongly agree			3	.422	1	.422	2	.844
Total	3.66	35	3.59	32.9	3.28	32.1	3.51	100

8.2 Additional regression analysis

Living area that is prone to flooding on intention to prepare

Moreover, concerning the control variables, there was no statistical significance on the intention to prepare, whether people lived in an area prone to flooding, those who did not, or if they were unsure about this information (Table G). Moreover, the level of the risk of floods assessed by the respondents who live in a flood-prone area did not influence their level of preparation among the one who lived in a flood-prone area. However, the sample for this latter variable is very limited (*N=38*). Hence no conclusion can be drawn.

TABLE G: Linear regression of living situation on intention to prepare

mean_intention	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Living area : bases	0	.	.	.	.	.	
No	-.199	.176	-1.13	.258	-.546	.147	
Do not know/unsure	.034	.202	0.17	.868	-.365	.432	
Constant	3.284	.156	21.02	0	2.976	3.592	***
Mean dependent var		3.172	SD dependent var			0.965	
R-squared		0.013	Number of obs			237	

**** p<.01, ** p<.05, * p<.1*

TABLE H: Lineral regression of intention to prepare, by level of risk flood

mean_intention	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Riskfloodarea	.004	.158	0.03	.978	-.316	.325	
Constant	3.27	.537	6.09	0	2.18	4.359	***
Mean dependent var		3.284	SD dependent var			0.926	
R-squared		0.000	Number of obs			38	

*** p<.01, ** p<.05, * p<.1*

Previous experience on intention to prepare

Table I shows a close to significant relationship between previous experience and intention to prepare. According to the results, respondents who did not experience flood were likely to have less intention to prepare than respondents who did have such experience (*p<0.08*). Since the results are close to significant but not entirely, assessing any relation between previous experience and intentions to prepare is impossible. Moreover, among the respondents with previous experience, the level of house damage is positively correlated with intention to prepare (*p<0.03*). However, the limited number of observations concerning the people who already had a previous experience (*N=45*) and it is difficult to take any conclusions from these variables, as well as the living area variable.

TABLE I: Linear regression of previous experience on intentions to prepare

mean_intention	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Previous exp : bas~s	0	.	.	.	.	.	
No	-.281	.159	-1.77	.078	-.595	.032	*
Constant	3.404	.143	23.76	0	3.122	3.687	***
Mean dependent var		3.176	SD dependent var			0.965	
R-squared		0.013	Number of obs			238	

*** p<.01, ** p<.05, * p<.1*

TABLE J: Linear regression of house damage on intention to prepare

mean_intention	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Housedamage	.398	.185	2.15	.037	.025	.772	
Constant	2.767	.327	8.47	0	2.108	3.426	**
Mean dependent var		3.404	SD dependent var			0.960	
R-squared		0.097	Number of obs			45	

*** p<.01, ** p<.05, * p<.1*

Table K shows that emotional appeals had no particular effect on perceived self-efficacy and response efficacy compared to the neutral condition.

Table K: Linear regression of emotional appeals on self-efficacy

Selfefficacy_1	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
group : base Control	0	.	.	.	.	.	
Fear	-.171	.16	-1.07	.284	-.486	.143	
Hope	.053	.161	0.33	.743	-.265	.37	
Constant	3.107	.111	28.07	0	2.889	3.325	***
Mean dependent var		3.068	SD dependent var			1.015	
R-squared		0.009	Number of obs			237	

*** p<.01, ** p<.05, * p<.1*

Table L: Linear regression of emotional appeals on response efficacy

Responseefficacy	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
group : base Control	0	.	.	.	.	.	
Fear	.073	.164	0.45	.656	-.25	.396	
Hope	.192	.165	1.16	.246	-.133	.517	
Constant	1.94	.114	17.02	0	1.715	2.164	***
Mean dependent var		2.025	SD dependent var			1.037	
Akaike crit. (AIC)		693.469	Bayesian crit. (BIC)			703.873	

*** p<.01, ** p<.05, * p<.1*

However, the results in Table M from the regression analysis of self-efficacy on intentions to prepare show a positive correlation: the more people had a high perception of self-efficacy, the higher they had intentions to prepare (p<.001). However, this relation does not exist concerning the effects of response efficacy and intentions to prepare.

Table M: linear regression: effects of self-efficacy on intentions to prepare

mean_intention	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Selfefficacy_1	.202	.061	3.32	.001	.082	.321	***
Constant	2.558	.196	13.02	0	2.171	2.945	***
Mean dependent var		3.176	SD dependent var			0.967	
R-squared		0.045	Number of obs			237	

*** p<.01, ** p<.05, * p<.1*

Table N: linear regression: effects of response efficacy on intentions to prepare

mean_intention	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Responseefficacy	-.054	.061	-0.90	.371	-.174	.065	
Constant	3.282	.138	23.81	0	3.01	3.553	***
Mean dependent var		3.172	SD dependent var			0.965	
R-squared		0.003	Number of obs			237	

*** p<.01, ** p<.05, * p<.1*

Intentions to prepare: by items

The analysis if there were no differences between the results of the emotional appeals on intentions to prepare with the mean of the items to measure intentions to prepare, each item was regressed individually. The only item that showed different results compared to the ones of mean of the items, is the item "Store water, food (…)" for which the relation between the hope and the control group becomes insignificant (Table Q), as well as for the item "Renovate my house (…) in Table T.

Table P: Linear regression of "Learn more about flooding risks in my living area" by group

Intentiontobehave_1	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
group : base Control	0	.	.	.	.	.	
Fear	-.089	.163	-0.55	.586	-.41	.232	
Hope	-.402	.164	-2.45	.015	-.725	-.079	**
Constant	3.679	.113	32.53	0	3.456	3.901	***
Mean dependent var		3.521	SD dependent var			1.046	
R-squared		0.027	Number of obs			238	

*** p<.01, ** p<.05, * p<.1*

Table Q: Linear regression of "Store water, food, and other important supplies at my house" by group

Intentiontobehave_2	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
group : base Control	0	.	.	.	.	.	
Fear	-.086	.193	-0.45	.655	-.466	.293	
Hope	-.21	.194	-1.08	.28	-.592	.172	
Constant	3.381	.134	25.29	0	3.118	3.644	***
Mean dependent var		3.286	SD dependent var			1.223	
R-squared		0.005	Number of obs			238	

*** p<.01, ** p<.05, * p<.1*

Table R: Linear regression of "Make an evacuation plan for myself and my family and practice it" by group

Intentiontobehave_3	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
group : base Control	0	.	.	.	.	.	
Fear	-.26	.192	-1.35	.177	-.639	.119	
Hope	-.374	.194	-1.93	.055	-.756	.008	*
Constant	2.94	.134	21.95	0	2.676	3.204	***
Mean dependent var		2.734	SD dependent var			1.225	
R-squared		0.017	Number of obs			237	

*** p<.01, ** p<.05, * p<.1*

Table S: Linear regression of "Get house insurance that covers flood damages" by group

Intentiontobehave_4	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
group : base Control	0	.	.	.	.	.	
Fear	-.173	.206	-0.84	.402	-.58	.233	
Hope	-.462	.208	-2.22	.027	-.871	-.053	**
Constant	3.699	.144	25.75	0	3.416	3.982	***
Mean dependent var		3.494	SD dependent var			1.317	
R-squared		0.021	Number of obs			237	

*** p<.01, ** p<.05, * p<.1*

Table T: Linear regression of "Renovate and adapt my house to make it less vulnerable to floods" by group

Intentiontobehave_5	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
group : base Control	0	.	.	.	.	.	
Fear	-.292	.214	-1.36	.175	-.714	.131	
Hope	-.364	.216	-1.69	.093	-.789	.061	*
Constant	3.048	.149	20.42	0	2.754	3.342	***
Mean dependent var		2.835	SD dependent var			1.363	
R-squared		0.014	Number of obs			237	

*** p<.01, ** p<.05, * p<.1*

8.3 Survey (flow)

- Standard: Introduction (1 Question)
- Block: Demographic (6 Questions)
- Standard: Knowledge (2 Questions)
- Standard: Previous experience (3 Questions)
- Standard: Imagine scenario (1 Question)
- Standard: Instructions reading flyer (1 Question)
- BlockRandomizer: 1 - Evenly Present Elements
  - Group: Control
    - EmbeddedData
      - group = 1
    - Standard: experiment control group (1 Question)
  - Group: Fear
    - EmbeddedData
      - group = 2
    - Standard: Manipulation fear (1 Question)
  - Group: Hope
    - EmbeddedData
      - group = 3
    - Standard: Manipulation hope (1 Question)
- Standard: Emotion (1 Question)
- Standard: Intentions to prepare (1 Question)
- Standard: Perceived efficacy (1 Question)
- Standard: Acceptability (1 Question)
- Standard: Attention checks (2 Questions)

8.4 Survey (text)

Start of Block: Introduction

(Introduction): Welcome to this survey about flood preparedness!

Answering the questionnaire takes approximately 5 minutes. You will respond to this survey anonymously.
This study is part of a master's thesis in political science, conducted at the University of Gothenburg.
Kindly, Sorenza Guérin
gusgueso@student.gu.se

End of Block: Introduction

Start of Block: Demographic

(Age) How old are you?

_____

(gender) How do you describe yourself?

- ○ Male (1)
- ○ Female (2)
- ○ Non-binary / third gender (3)
- ○ Prefer to self-describe (4) _____
- ○ Prefer not to say (5)

(Country) In which country do you currently reside?

- ○ Sweden (1)
- ○ France (2)
- ○ Other: (3) _____

(Income) What is your income per month (after taxes) ?

- ○ Less than €999€ (1)
- ○ €1000 - €1999 (2)
- ○ €2000 - €2999 (3)
- ○ €3000 - €3999 (4)
- ○ €4000- €4999 (5)
- ○ Over €5000 (6)

(Employement) What is your current employment status?

- ○ Employed (1)
- ○ Unemployed (2)
- ○ Self-employed (3)
- ○ Student (4)
- ○ Retired (5)
- ○ Other (6)

(education) What is the highest education level that you have completed?

- ○ Below a high-school diploma (1)
- ○ High-school diploma (2)
- ○ Bachelor's degree or equivalent (3)
- ○ Master's degree or equivalent (4)
- ○ Doctoral degree (5)

End of Block: Demographic

Start of Block: Knowledge

(Living area) A flood is a natural hazard that occurs when water overflows a normally dry land.

To your knowledge, do you live in a flood-prone area?

- ○ Yes (1)
- ○ No (2)
- ○ Do not know/unsure (3)

Display This Question:
If Living area = Yes

(Risk flood area) How do you perceive the likelihood of flooding in your living area?

- ○ Extremely unlikely (1)
- ○ Unlikely (2)
- ○ Neither likely or unlikely (3)
- ○ Likely (4)
- ○ Extremely likely (5)

End of Block: Knowledge

Start of Block: Previous experience

(Previous experience) Have you previously been affected by a flood?

- ○ Yes (1)
- ○ No (2)

Display This Question:
If Previous exp = Yes

(House damage) Has your property been damaged because of flooding?

- ○ Not at all (1)
- ○ Slightly (2)
- ○ Moderately (3)
- ○ Severely (4)

Display This Question:
If Previous exp = Yes

(Personal injury) Have you been personally injured because of flooding?

- ○ Not at all (1)
- ○ Slightly (2)
- ○ Moderately (3)
- ○ Severely (4)

End of Block: Previous experience

Start of Block: Imagine

(Imagine scenario) IMPORTANT: For the rest of the study, you are asked to imagine that a flood could happen in your living area.

End of Block: Imagine

Start of Block: Instructions reading flyer

(Instructions) On the next page, you will read a flyer about flood preparedness.

Please take the time to read EVERY element of the flyer. The information is important for completing the rest of the survey.

End of Block: Instructions reading flyer

Start of Block: experiment control group

Control (neutral message)

End of Block: experiment control group

Start of Block: Manipulation fear

Fear appeal

End of Block: Manipulation fear

Start of Block: Manipulation hope

Hope appeal

End of Block: Manipulation hope

Start of Block: Emotion

(Emotion) How do you feel about floods after reading the flyer?

	Not at all 1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	8 (8)	Extremely 9 (9)
Hopeful that I can handle the consequences (1)	○	○	○	○	○	○	○	○	○
Worried about the consequences (2)	○	○	○	○	○	○	○	○	○

End of Block: Emotion

Start of Block: Intention to behavior

X→

(Intention to prepare) "In the future, I intend to...

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)	I already have done/do that (99)
Learn more about flooding risks in my living area (1)	○	○	○	○	○	○
Store water, food, and other important supplies at my house (2)	○	○	○	○	○	○
Make an evacuation plan for myself and my family and practice it (3)	○	○	○	○	○	○
Get house insurance that covers flood damages (4)	○	○	○	○	○	○
Renovate and adapt my house to make it less vulnerable to floods (5)	○	○	○	○	○	○

End of Block: Intention to behavior

Start of Block: Perceived preparedness

(Perceived efficacy) How much do you agree with the following statements?

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I am confident in my ability to prepare for a flood. (1)	○	○	○	○	○
Floods are too devastating anyway, so there is no point in preparing for them. (2)	○	○	○	○	○

End of Block: Perceived preparedness

Start of Block: Legitimacy/trust

(Acceptability) Do you think it is acceptable for governments to distribute flyers similar to the one you have read to inform people about flood preparedness?

- ○ Completely unacceptable (1)
- ○ Somewhat unacceptable (2)
- ○ Neither acceptable nor unacceptable (3)
- ○ Somewhat acceptable (4)
- ○ Completely acceptable (5)

End of Block: Legitimacy/trust

Start of Block: Manipulation check

(check_1) According to the information given in the flyer, are the following statements true?

Floods are among the most frequent natural hazards in Europe

- ○ True (1)
- ○ False (2)
- ○ Do not know (3)

(check_2) It is MORE recommended to drive a car than to swim in flood waters:

- ○ True (1)
- ○ False (2)
- ○ Do not know (3)

End of Block: Manipulation check
