

Candidate: 10005

Understanding risk perception in Norwegian risk communities

Bachelor's thesis in PSY2900

Supervisor: Amanda Elizabeth Lai

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Preface

This study was part of a larger research project planned by the author's supervisor. The research project focuses on predictors and barriers of climate change adaptation in Norwegian risk communities. I partook as a group of students in the bachelor thesis project named "BA01 – What does it take to invest in protective actions? Predictors and barriers of climate change adaptation. A focus on risk communities in Norway". The ideas for this study's hypotheses were acquired by reading literature on risk perception and hazard, as well as readings on the different types of variables that have been explored in the context of risk perception. The ideas in this study are my own. Instructions and guidance from my supervisor and her assistants have been received throughout the study.

I wish to thank my fellow students in the bachelor's program for valuable discussions about the topics of this study. They have been a helpful and motivating team to work with. I also wish to thank my supervisor for her invaluable contributions as well as her assistants that have been available throughout. Special thanks are extended to my boyfriend, for his help in keeping my references organized and for his support.

Having said all this, I declare that the body of work submitted is my own.

Abstract

How people perceive risk has been shown to be linked to behaviour and attitudes towards specific policies. What influences risk perception is thus important to gain an understanding of what might lead to pro-environmental behaviour. Many factors have shown to be of influence on risk perception, and the context under research seems to be an explanation of the different findings. The aim of this study was therefore to investigate flood risk perception in Norwegian communities. To gather data a questionnaire was developed and shared through Facebook. The variables that were focused on for the analysis were flood experience, place attachment and flood risk perception. A correlation analysis was used to test for a positive correlation between direct flood experience and flood risk perception (H1). It was also tested for a positive moderation effect of place attachment between direct flood experience and flood risk perception (H2). Significant findings were found in support of H1. The overall moderation model and the interaction effect of place attachment were significant. However, at high levels of place attachment, the moderation effect was nonsignificant. Results are discussed considering the literature on heuristics, place identity, and place attachment.

1. Introduction

Climate change is one of the main global issues today. With the rising temperatures due to anthropogenic emissions from the pre-industrial period to the present, there is a high probability that it will continue to cause further long-term changes in the climate system (IPCC, 2022). Floods are one of the most destructive climate hazards and are a high risk in Norway. Climate projections for Norway indicate increases in temperature and precipitation, which will lead to changes in both frequency and magnitude of floods in the future (Roald, 2021, p. 59).

Research about potential predictors of risk perception and risk perception itself is not only important to account for what people fear and why. Knowledge about risk perception is also important because of what it means for risk exposure, risk communication, and risk management. For example: As among other variables, high levels of risk perception have been shown to exert a positive effect on preventative behaviour and in improving people's willingness to cope with an environmental risk (De Dominicis et al., 2015). People with direct experience of severe weather or climate-related phenomena tend to have a higher risk perception of climate change as well as being more supportive of mitigation policies, compared to people that are more psychologically distant (Spence et al., 2012). Living in areas prone to high risk from natural hazards has shown to make individuals more inclined to support and undertake risk mitigation if they have previously been evacuated ahead of an impending disaster (Tanner & Arvai, 2017). Other studies have shown that risk perception as a cognitive process guides people's behaviour in situations involving potential risks (Ferrer & Klein, 2015; Rosi et al., 2021). In sum, how people perceive risk is important because it influences people's behaviour as well as the acceptance of - and commitment to - specific policies.

Risk perception frequently differs between laypeople and experts (Savadori et al., 2004; Siegrist et al., 2018; Sjöberg, 1998). The complexity of the individual risk perception is something different from the objective risk assessment done by experts, and therefore they tend to diverge (Kunreuther et al., 2014). Risk perception is in other words a subjective judgment about the characteristics and severity of risk (Slovic, 1987). Thus, making risk perception an emotional construct that is driven by unconscious emotional processes (Gifford, 2014), as well as cognitive heuristics that can influence decision making (Tversky & Kahneman, 1974).

In the literature on risk perception many factors have been shown to influence risk perception, some of them being: hazard characteristics, demographics, trust (or lack of trust), knowledge, value orientation, psychological traits, optimistic bias, and heuristics (Siegrist & Árvai, 2020; Wachinger et al., 2013). This study will mainly focus on hazard experience and

place attachment. Their influence on risk perception and how they are related will be discussed down below (1.1, 1.2).

1.1 Hazard experience and risk perception

Experience with hazards has been shown to influence risk perception. In a study by Siegrist and Gutscher (2006) personal experience was found to magnify the assessed risk of flooding. Another study published by the Society for Risk Analysis also found that perceived risks associated with coastal flooding and storm sea surges were greater in respondents who had experienced previous flood hazards (Kellens et al., 2011). Literature on experience and risk perception, often distinguished between different types of experience, such as indirect and direct experience, which shows that direct experience is the one that influences risk perception the most (Becker et al., 2017; Bronfman et al., 2020). Research done after the winter flooding (2013/2014) in the UK showed that the direct experience of flooding led to an overall increase in the salience of climate change, pronounced emotional responses and greater perceived personal vulnerability and risk perception (Demski et al., 2017a). While there is empirical evidence for a positive relationship between hazard experience and risk perception, there is a lack of research on the mechanisms that may explain this. However, in the literature of psychology, there has been a lot of attention on the possible role of heuristics to explain how experience might affect risk perception, availability heuristic and optimistic bias being some of them (Greening et al., 1996; Keller et al., 2006a; E. Peters et al., 2006).

Availability heuristics is thought to influence people's judgments about risk in terms of how easy relevant events come to mind. In other words, people assume that the likelihood of an event is greater the easier it is to remember (Kahneman et al., 1982). Studies on the effects of emotions on memory have found that emotionally arousing events are more likely to be remembered (Kensinger, 2009; McGaugh, 2018). A study conducted on memory for directly and indirectly experienced events showed that those that directly witnessed the event remembered more on the recall tests, compared to the group with the indirect experience (Toglia et al., 1992). As such, direct experience of flooding should make the event more cognitively available in the individual's mind, and in turn, increase the perceived probability of its recurrence.

People also tend to overestimate the personal likelihood of experiencing positive events and consider themselves less likely to experience negative events, than other people. This is known as 'optimistic bias' (Weinstein, 1980), or in the context of threats 'perceived

invulnerability' or 'subjective immunity' (Klein & Helweg-Larsen, 2002). The optimistic bias appears to be more likely when the individual perceives to be in the control of the risk (Klein & Helweg-Larsen, 2002). The optimistic bias can thus be reduced and change the risk perception if one experiences a lack of control of the situation. In keeping with this, optimistic bias has shown to be less likely when the individual has direct personal experience of a hazard and its outcome (Facione, 2002; Helweg-Larsen, 1999; Parry et al., 2004). It has also been shown that perceived personal damage from a hazardous event has the largest impact on people's belief that their local area is more prone to hazards, than globally (Lujala et al., 2015).

However, there is some evidence that shows that repeated exposure to hazards can lead to desensitisation to the threat and redefine what is acceptable (Halpern-Felsher et al., 2001). The findings in support of the desensitisation hypothesis are particularly true for voluntary hazardous activities or those with less visible consequences or low personal damage (Barnett & Breakwell, 2001). This implies that hazard experience does not necessarily lead to higher risk perception if it is voluntary or has a low personal impact. It might even lead to a false sense of security and decreased risk perception (Hall & Slothower, 2009; Halpern-Felsher et al., 2001).

In sum, the literature on hazard experience and risk perception are in favour of a positive correlation, especially for cases where the experience is direct, involuntary and has an impact on the individual (Barnett & Breakwell, 2001; Lujala et al., 2015). Based on the reviewed literature the following hypothesis is:

H1: Experience with flooding will positively correlate with flood risk perception.

1.2 Place attachment as a moderator

The concept of place attachment derives from Bowlby's attachment theory and refers to affect and emotions that connect people to places (Bowlby, 2005). In the literature, and the way used here, place attachment refers to the emotional connection or bond a person has to groups, communities, and their physical environment (Low & Altman, 1992; Mazumdar, 2005; Mazumdar & Mazumdar, 1993). Research on the relationship between place attachment and risk perception is unclear, on account of contradictory results.

There is evidence for both a negative and a positive relationship between place attachment and risk perception. For example, a study found place attachment, risk perception and risk knowledge to be positively correlated in the context of volcanic eruption risk in Iceland (Bird et al., 2011). A positive association between place attachment and environmental risk perception was also found in the case of exposure to prolonged drought in Australia. They found

that those with a stronger place attachment were more concerned about the drought and were therefore aware of it (Stain et al., 2011). Other studies yield similar results in support of a positive relationship between place attachment and risk perception (Burley et al., 2007; Zhang et al., 2014), some studies also show more articulated patterns of results. For example, in two studies it was found that higher place attachment was associated with higher risk perception in the case of frequent occurrence and apparently less dangerous risk. This positive relationship was no longer significant in the case of less frequent but apparently more dangerous risk (Bernardo, 2013; Bonaiuto et al., 2011).

Other studies have found that place attachment leads to lower risk perception and awareness. For example, a study on perceived seismic risk exposure in Romania found that place attachment correlated with a feeling of safety, which led them to ignore and even deny the risk or that, if affected, the damage would be minimal (Armaş, 2006). While a study in the UK found that salient local identity led to a lower risk perception of local beach pollutants (Bonaiuto et al., 1996). It is also argued that place attachment may lead to automatic defensive mechanisms (e.g., self-affirmation theory; (Sherman & Cohen, 2006)) when the risk is perceived to threaten our social identity (Bonaiuto et al., 1996; Breakwell, 1986; Speller & Twigger-Ross, 2002).

In sum, the predominance of empirical evidence is in favour of a positive correlation between place attachment and risk perception. However, considering all the mixed results it is likely to infer that the effect place attachment has on risk perception relies on the context under research. For this study, the moderation effect of place attachment has on the relationship between experience and risk perception in Norway will be the context of interest. The following hypothesis is:

H2: Place attachment will positively moderate the relation between direct flood experience and flood risk perception.

2. Method

2.1 Sample

Snowball method was used for participant recruitment as it was the most convenient way to gather data. Two hundred and ninety-three Norwegian residents filled out the survey. For the current project, we were interested in participants living in Norway, both with and without experience with flooding.

Their age ranged from 18-79 ($M = 44.48$, $SD = 16.70$) and included 160 women 126 men, one non-binary and six others that preferred not to answer. Participants' level of education

ranged from junior high school to higher education. Twenty-eight per cent had no higher education, four per cent had taken a year unit, 33% were undergraduates and 36% were postgraduates. In terms of the living situation, 210 of the respondents were homeowners, 55 were renting, 21 were living at their parent's place and seven reported "other". One hundred and eighty-three reported having children, of these, 98 had children still living at home with them. Regarding flooding experience, 53% reported that they had indirect and/or direct experience with flooding, while 47% had never been personally affected by flooding.

2.2 Procedure

For data collection, our supervisor received approval from NSD in March 2021 for her project, which also applied to our study. The survey was published and shared through social media (Facebook) by the research group. It was also published on different Facebook groups related to communes with flood experience. The participants were informed about the study before conducting the survey. The survey was voluntary, and all answers were anonymous.

2.3 Measures

This study was part of a larger project investigating predictors and barriers of climate change adaptation in Norwegian risk communities. The variables used for this study were flood risk perception, personal experience of flood and place attachment.

Flood risk perception

To assess flood risk perception, an 8-item scale measured on a 5-point Likert scale was used ($\alpha = .68$), adapted from Wilson et al. (2018). The items used were: "When you think about floods, to what extent do you feel worried?", "When you think about floods for a moment, to what extent do you feel anxious?", "If you did experience a flood, would it have a severe effect on you personally?", "How risky are floods?", "How likely is it that a flood will occur where you live?", "If I did experience a flood, it is likely that it would negatively impact me", "I am confident that a flood will not occur where I live", and "When you think about floods for a moment, to what extent do you feel fearful?".

Personal experience with flood

Personal experience with flood was measured on a nominal scale inspired by van der Linden (2015) and Clarke et al. (2018), and consisted of four items: "I have been directly affected by a flood (e.g., property flooded)", "I have been indirectly affected by a flood (e.g.,

traffic disruption, road closures, flood threats to property, floods in neighbouring municipalities)”, “I have been affected by a flood both directly and indirectly”, and “I have never been personally affected by a flood”. Then, participants’ responses were recoded into two main categories: experience/no experience (see section 2.4), to test if direct experience positively correlates with flood risk perception (H1).

Place attachment

A 5-point Likert scale was used to measure place attachment ($\alpha = .87$). The measure consisted of 7-items adapted from Kaltenborn & Bjerke (2002). The items included were: “I feel a sense of emotional attachment to this place”, “This area feels like a part of me”, “I identify strongly with this area”, “I enjoy living here more than I would other places in this country”, “The area is important to me because of my lifestyle”, “It feels meaningful to live here”, and “I feel safe and secure here”.

2.4 Statistics

Data were submitted to and undertaken using the statistical analysis program, IBM SPSS Statistic version 27.0. To test H1, a point-biserial correlation in SPSS was used, and H2 was tested using a moderation model in PROCESS version 4.1 for SPSS (Hayes, 2022).

Before recoding the nominal experience variable of four items into a binary scale, an independent samples t-test was carried out to test the mean difference in risk perception between no experience and indirect experience. The analysis showed a nonsignificant difference in risk perception between those who had no experience, $M = 18.46$, $SD = 4.48$, and those who had indirect experience with flooding, $M = 18.22$, $SD = 4.44$, $t(219) = .418$, $p = .676$. The nonsignificant finding of mean difference in risk perception between those who had no experience and those who only had indirect experience gave support for the assumption that indirect experience would not have a significant influence on risk perception.

To test for a positive correlation between direct experience and risk perception (H1), experience was recoded into a dichotomous variable where “direct experience” and “direct & indirect experience” equalled 1, while “no experience” and “only indirect experience” equalled 0. With the new variable, a point-biserial correlation was used to test H1.

To investigate if place attachment moderates the relation between direct flood experience and risk perception (H2) a simple moderator analysis was performed using PROCESS model 1. The predictor variable for the analysis was experience. The moderator variable for the analysis was place attachment. The outcome variable for analysis was risk

perception. The significance of the effect was evaluated using 5000 bootstraps to create bias-corrected confidence intervals (95% CI).

3. Results

Table 1

Point-Biserial Correlation for Flood Experience and Flood Risk Perception (N=293)

Variable	1	2
1. Flood Experience	—	
2. Risk perception	.19**	—

Note. ** $p < .01$

Table 1 shows correlation between flood experience and flood risk perception. Results showed a significant positive relationship between flood experience, $M = 0.18$, $SD = 0.39$, and flood risk perception, $M = 18.76$, $SD = 4.6$, $r(291) = .19$, $p = .001$. Indicating that direct flood experience causes an increase in flood risk perception.

Table 2

Moderation Model of Flood Experience (IV), Place Attachment (MOD) and Flood Risk Perception (DV) (N = 293)

Variable	coeff	SE	R^2	95% CI	
				Lower	Upper
Model 1			.05**		
(Constant)	16.44***	1.70		13.09	19.78
Flood Experience	10.37**	3.81		2.87	17.88
Place attachment	0.07	0.065		-0.05	0.19
(Interaction)	-0.29*	0.13		-0.56	-0.03

Note. CI = confidence interval. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 2 shows results from the moderation model where the predictor is flood experience, outcome is flood risk perception and place attachment, $M = 27.62$, $SD = 4.87$, is the moderator. The moderation model was significant, $F(3,289) = 5.09$, $R^2 = .05$, $p = .002$. The

interaction in the model was significant, $b = -0.29$, 95% CI [-0.56, -0.03], $t = -2.18$, $p = .030$, indicating that the relationship between flood experience and flood risk perception is positively moderated by place attachment.

Results for the conditional effect showed that for low levels of place attachment, the association between flood experience and flood risk perception was significant, conditional effect = 3.32, CI [1.64, 4.99], $p < .001$. Significant findings were also found for average levels of place attachment, conditional effect = 2.14, CI [0.80, 3.48] $p = .002$. While for high levels of place attachment, flood experience did not have a significant effect on flood risk perception, conditional effect = 0.67, CI [-1.25, 2.59], $p = .49$. This means that the magnitude of flood experience and flood risk perception increases when place attachment increases, but only at low and average levels. At high levels, place attachment does not seem to have any effect on the two variables.

4. Discussion

The findings supported a positive correlation between flood experience and flood risk perception (H1). Place attachment was found to have a significant interaction effect on the relationship between flood experience and flood risk perception, which is in line with what was predicted (H2). However, this effect was only found at low and average levels of place attachment. At high levels of place attachment, the relationship between flood experience and flood risk perception was nonsignificant.

A positive correlation between hazard experience and risk perception has been found in studies before (Kellens et al., 2011; Siegrist & Gutscher, 2006). It has also been shown that direct hazard experience influences risk perception the most compared to indirect experience (Becker et al., 2017; Demski et al., 2017). This correlation can be understood considering the heuristics that this study has chosen to focus on: availability heuristics and perceived invulnerability.

When it comes to the availability heuristic, direct experience of flooding is likely to be more emotionally inducing on the individual, compared to having an indirect experience, thus making it more memorable and easier to retrieve, which will increase the perception of flood risk and its likelihood. Studies in the domain of health psychology have demonstrated how the perceived likelihood of risk increases if it has been experienced, presumably because experience is used as a cue (Greening et al., 1996; Peters et al., 2006). Experience is also thought to be effective in increasing risk perception by reducing perceived invulnerability. In line with

this, research has shown that perceived invulnerability is less likely in individuals with direct hazard experience (Facione, 2002; Helweg-Larsen, 1999; Parry et al., 2004).

The significant findings of place attachment as a moderator at low and average levels can also be explained in terms of heuristics. Place attachment as an affective component can be thought to make the flooding experience easier available and in turn increase risk perception (Keller et al., 2006). However, it should be noted that affection alone is also considered to be part of an own mode of thinking (the experiential system), as opposed to the analytical system (Keller et al., 2006; E. M. Peters et al., 2004; Slovic et al., 2004). Implying that affection can be considered not only an indirect component of risk perception (through availability) but as a direct effect on risk perception. Regarding flooding experience and flood risk perception, it can be thought that place attachment evokes stronger feelings related to the flooding experience and is brought to mind as a cue (Peters et al., 2004), for estimating the flood risk probability explaining the increase in flood risk perception.

At high levels of place attachment, the moderation effect between direct flood experience and flood risk perception was not significant. This result can be understood considering the literature on the negative relation between place attachment and risk perception (Armas, 2006; Bonaiuto et al. 1996). High place attachment can be thought to increase the feeling of safety which then leads to ignorance or denial of the potential risk, as has been shown in the study on perceived seismic risk exposure in Romania (Armas, 2006), and in studies on beach pollution threat and volcano risk reported in a reviewed study performed by Bonaiuto et al. (2016). Place attachment is also linked with our place identity, and in terms of self-affirmation theory, it is argued that when we perceive a threat to our place identity, automatic processes enact various defensive responses to protect our place identity (Bonaiuto et al., 1996; Breakwell, 1986; Speller & Twigger-Ross, 2002). In this case, high levels of place attachment can be thought to serve as a threat to place identity, activating different types of defence mechanisms that reduce risk perception. This would explain why at high levels of place attachment, the moderation effect between flood experience and flood risk perception is not significant.

5. Limitations and further research

This study only tested for correlation relationships; hence one cannot make causal inferences. The discussion part is therefore not empirically supported by this study and should be read as suggestions supported by the literature. The survey conducted relied on self-reported data, which is known to have its disadvantages. Another limitation is the use of a voluntary

response sample which can give biased results. As the questionnaire was published and shared through Facebook information about the response rate has not been obtained. This recruitment process has its limitations considering lack of randomisation leading to a possible selection bias. This makes it difficult to ensure that the results are representative of Norwegian communities.

However, besides the limitations of the study, there is a lot of literature that has similar findings. The results should thus be taken seriously and be of further interest to research topics on Norwegian risk communities and in the more general field of hazards and risk perception. Further research would benefit from a research design that would allow for causal inferences and should investigate the explanations behind the correlations as well as test for possible competing explanations. A way to test for competing explanations could be to run analysis of other variables that has shown to be central in the literature of risk perception. Qualitative interviews might also be used to explore the explanations in depth or to discover new explanations that could be of interest when drawing a conclusion.

6. Conclusion

This study found support for a positive correlation between direct flood experience and flood risk. The correlation was discussed given availability heuristics and perceived invulnerability. Support for hypothesis 2 was found. The effect of flood experience on flood risk perception are conditional to the levels of attachment. At low and average levels of place attachment the conditional effect was significant, while at high levels it was nonsignificant. In the discussion, it was argued that place attachment as an affective component would increase the risk perception. For the nonsignificant results at high levels of place attachment, perceived safety and defence against a perceived threat to the place identity were mentioned as possible explanations. As this study is only correlational with a few selected variables, further research should investigate the conditions in greater detail and test competing explanations to get a better understanding of what might explain the results that were found.

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