

Personalizing Warning messages: Sensation seeking as a predictor of risk perception, information sufficiency and self-efficacy

Bachelor Thesis

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Abstract

As social media and mobile phones become increasingly popular, it became much easier and faster to spread news and information. Cell-broadcasting systems such as NL-Alert are used to spread emergency information to everyone within a certain distance to the danger.

Furthermore, news stations, authorities and organizations which are responsible for public safety use social media to inform the public. Users have access to additional information online, including pictures and videos of an emergency.

According to the Extended Parallel Processing Model by Witte (Rintamaki & Yang, 2014) and the Protection Motivation Theory by Rogers ((Maddux & Rogers, 1983), it is important to communicate the right amount of risk-perception and reach an adequate level of information sufficiency so that the individual feels capable of performing tasks to reduce risks to themselves and not become overwhelmed.

How such warning messages are processed also depends on personality traits of the individual. Sensation seeking is a personality trait that is often associated with risk behavior. Personalizing warning messages on social media or NL-Alert could therefore be a way of reaching adequate levels of risk perception, information sufficiency and self-efficacy for high- and low-level sensation seekers. To test if the amount of information in a warning message has an effect on the above mentioned variables, a between subject-design was chosen, with two conditions. In condition one, participants were presented with a standard NL-Alert message while participants in the other condition read the same message in combination with a Facebook post including additional information in condition two. In total, 124 participants were included in the analysis. An ANOVA showed no significant differences among the two conditions. A regression analysis did not confirm that sensation seeking is a good predictor of risk perception, information sufficiency and self-efficacy. In further research, the vignette should be improved so that participants can better imagine themselves in the emergency situation and the information sufficiency scale should be improved so that all items measure indeed one construct.

Introduction

In the past years, social media networks such as Facebook and Twitter have become increasingly popular. Not only young people make use of such networks, but also more and more older people do. The percentage of active users increased from 72.5% in 2012 to 95.8% in 2017 among 35 to 44 year old and from 43.3% to 83.6% among 55 to 64 year olds in the Netherlands (Centraal Bureau voor de Statistiek, 2018).

The increased usage of social media networks goes along with a rising usage of mobile phones, especially smartphones, which make it possible to use SNS apps almost everywhere. The use of these apps does not even depend on available WIFI anymore because an increasing number of smartphone users have access to mobile data.

SNS such as Facebook were originally created to stay in touch with friends and family, but it developed into a network that is also used to gather information about what is happening in the world or society (Kwak, Lee, Park, Moon, 2010). Many users also use social media as their main source for news instead of using (online) newspapers or television to get informed and news agencies have recently adapted to this changing pattern by posting information on SNS platforms such as Facebook and Twitter (Winter et al., 2015).

What makes SNS so special is that it allows a two-way communication instead of a top-down communication. Users can create and spread content themselves or react to content published by others. Since smartphones and SNS are used by so many people, SNS became one of the easiest and fastest platforms to reach people, spread information and share one's opinion about it.

The Netherlands made use of the increasing popularity of mobile phones and introduced an alarm system based on cell-broadcasting in 2012 (Gutteling, Terpstra, & Kerstholt, 2017). In case of emergency, all people within a certain range from the emergency location receive a warning message on their mobile phone. That makes it possible to not only

indicate that there is a risk which was usually done by using sirens, but also inform citizens about what has happened and what they can do to minimize risk to themselves. A typical warning message by NL-Alert looks like this: NL-Alert 21-05-2018 11:20 Explosion hazard due to gas leakage in industrial area. Avoid open fire. (Nationaal Coördinator Terrorismebestrijding en Veiligheid (NCTV), 2018).

NL-Alert does not include detailed information about the emergency and does not make it possible to react to the warning message and is therefore a one-way communication system. Furthermore, no advice on where to look for further information is given to the receiver, which makes it difficult to decide where to look for further information and which information channel is trustworthy.

According to Ter Huurne (2008), it can be problematic to have insufficient information about an emergency and a potential risk because it can lead to maladaptive responses to the risk. Therefore people often search for additional information during emergency situations in order to help making a decision or simply reduce fear and uncertainty. Motivation to search for further information comes when an individual realizes that there is a gap in knowledge about the risk. The process of assessing if one has gathered enough information is called information sufficiency (Ter Huurne, 2008).

Furthermore, someone's social environment influences information seeking behavior as well. Knowing that family and friends have a lot of knowledge about the topic will motivate the individual to come to the same level of knowledge (Ter Huurne, 2008).

Social media is therefore a good medium to gather information from official sites such as the local fire department or police station and also friends and families opinion about the emergency to make a decision about what best to do during an emergency.

Theoretical background

Two well-known models to explain adaptive or maladaptive behavior to an emergency or risk are the Extended Parallel Processing Model (EPPM) introduced by Witte (Rintamaki & Yang, 2014) and the Protection Motivation Theory by Rogers (Maddux & Rogers, 1983). According to the Extend Parallel Processing Model as described by Rintamaki and Yang (2014), the receiver of a warning message first evaluates if he or she is actually at risk, how severe the risk is and if the warning message is relevant for them. If this is the case, an efficacy appraisal takes place where the receiver decides if he or she has to do something about the risk. If both risk perception and self-efficacy are high, the receiver will try to reduce feelings of fear (Rintamaki & Yang, 2014). This is a very important step in the process because in this final step, the receiver decides if he or she wants to control the danger by taking action to actively reduce risk for themselves. When risk perception is high while self-efficacy and information sufficiency remain low, the receiver will control fear by denial, defensive avoidance or ignoring the warning (Rintamaki & Yang, 2014).

Rogers' Protection Motivation Theory is based on the concept of fear appeals. Fear appeals are messages to an individual to warn them about certain risks and recommendations to avoid or minimize potential risks (Maddux & Rogers, 1983). According to Milne, Sheeran and Orbell (2000), several factors influence the way in which the receiver perceives the message and how it influences his or her behavior. After receiving a fear appeal, the receiver's reaction is influenced by the environmental factors 'verbal persuasion' (how reliable is the information), 'observational learning' and intrapersonal factors such as personality traits and prior experience. If the perceived vulnerability, severity and fear about the risk is high, the receiver will likely show maladaptive behavior (Milne et al., 2000). When the receiver has a high level of perceived self-efficacy, perceived response-efficacy and

perceived response costs of adaptive behavior are high, the receiver is likely to adopt protective behavior to the risk (Milne et al., 2000).

As described in the above mentioned models, it is important to communicate a high level of risk perception, while also keeping a high level of self-efficacy and information sufficiency. Additional factors such as social pressure from peers and the quality of the warning messages influence someone's behavior in such a situation as well (Gutteling et al., 2017). When looking at social media, users will often have access to pictures or even videos of the emergency, which could lead to maladaptive behavior like denial, if they are overwhelmed by the news content.

According to research by Gutteling et al.(2017), it might be a successful strategy to personalize warning messages more and tailor them to certain groups of people so that the receiver has the right amount of fear but still feels capable to cope with the situation successfully. Warning messages by NL-Alert and on SNS are exactly the same for every user, while differences in certain aspects of personality are not considered even though it is possible that not everyone reacts in the same way towards such a warning message.

Current research shows that there is indeed a link between the level of resilience and personality traits. According to McKay, Skues, and Williams (2018), sensation seeking is positively linked to psychological resilience and problem-focused coping. Sensation seeking can be described as a higher need for novel experiences and a high willingness for physical and social risks (Zuckerman, 1994, p.27). Sensations seekers are more likely to engage in risky behavior such as doing drugs, reckless driving and performing dangerous sports. According to research by Horvath and Zuckerman (1993) this personality trait is a strong predictor of risky behavior in various areas. People who score high on the sensation seeking

personality trait experience the positive rewards of risky behavior more, than low sensation seekers. Another explanation is that sensation seekers have a strong ‘optimistic bias’.

Weinstein (1980), describes this term as the tendency to see oneself less at risk and evaluate the possibility of negative consequences as less likely.

The sensation seeking trait consists of the following four factors: Thrill- and adventure seeking, which contains dangerous physical activities such as dangerous sports, experience seeking (new experiences, nonconforming lifestyle), disinhibition (social and sexual disinhibition) and boredom susceptibility (aversion for repetition and routine) (Zuckerman, Eysenck, Eysenck, 1978).

When looking at the role of SNS in emergency situations, it is possible that individuals with a high level of sensation seeking are less likely to become overwhelmed by intensive media coverage. Sensation seeking might also be linked to a lower risk of stress and trauma related outcomes such as post traumatic stress syndrome (Husain & Norbury, 2015). It is possible that risk perception is lower in individuals who score high on sensation seeking because of their optimistic bias. Furthermore, research by Smorti in 2014 shows that people with the sensation seeking trait tend to have a low level of self-efficacy when engaging in various risky behaviors such as risky driving and substance abuse. These findings match with research by Cicognani and Zani (2012) on alcohol consumption among students. High sensation seeking in combination with a low score on self-efficacy was associated with higher alcohol consumption. Different reactions to emergencies could be, amongst other factors, linked to different levels of sensation seeking.

Research question and hypotheses

This leads to the following research question and hypotheses:

Is there a difference among high and low level sensation seekers in self-efficacy, information sufficiency and risk perception when being exposed to different types of warning messages?

H1: High level sensation seekers score significantly lower on self-efficacy, risk-perception and information sufficiency than low level sensation seekers.

H2: Scores on self-efficacy, information sufficiency and risk perception are significantly higher when participants receive more detailed information compared to receiving only little information.

Method

Participants and Design

To answer the above mentioned hypotheses, a one factor between-subjects design was chosen. The independent variables were risk perception, information sufficiency and self-efficacy.

In total, 139 Participants filled in the survey. 15 Participants had to be excluded because they stopped the survey after only answering a few questions and could therefore not be included in the analysis. The final sample consists of 34 men and 88 women (2 participants did not fill in their gender) between the ages 18 and 65 ($M = 21.91$, $SD = 6.51$).

The majority of participants has a high school diploma as their current highest degree of education and live in Germany. The survey was available online through a link and participants were recruited by convenience sampling over social media and over the SONA system of the university.

Procedure

The survey begins with an introduction text and a short instruction about what the participant is expected to do, followed by an informed consent. After agreeing to participate,

the respondents answer questions about demographic variables such as gender, age, level of secondary education and place. Subsequently, participants fill in a questionnaire measuring the personality trait sensation seeking. Participants were then randomly assigned to either the NL-Alert message group or the group who receives the NL-Alert message in combination with a Facebook post. In the first group, the concept of NL-Alert is briefly explained and a phone display with a short warning message about hypothetical scenario about a chemical fire nearby is shown. (see Appendix A)

In the second group, the same NL-Alert message was presented, but a Facebook post from a news site was added. This post contains additional information about the accident and some photos of what has happened. (see Appendix B). After reading these messages, the survey continued for all participants with measuring the dependent variables information sufficiency, self-efficacy and risk-perception.

At the end of the survey, the participants were thanked for their participation.

Materials

All items were measured with a 7-point Likert scale. To measure the variable Sensation seeking, the Brief Sensation Seeking scale by Hoyle, Stephenson, Palmgreen, Lorch and Donohew (2002) was used (see Appendix C). This questionnaire contains 8 items such as “I would like to explore strange places” or “I prefer friends who are excitingly unpredictable”. The items cover 4 sub-concepts of sensation seeking: Experience seeking, boredom susceptibility, thrill and adventure seeking and disinhibition. The Brief Sensation seeking scale has a relative high Cronbach’s Alpha value of $\alpha = .78$.

The items to measure self-efficacy were based on a self-efficacy scale by Ter Huurne (2008) and adapted to the situation of a chemical fire nearby. (see Appendix D). Examples of

the four items are “I would be able to protect myself against the possible consequences of exposure to toxins.” and “I would be able to get and make sense of information about this emergency.” This questionnaire has a Cronbach’s Alpha value of $\alpha = .82$.

Information sufficiency was measured with five items such as “ I know a lot about this emergency at the moment.” and “When it comes to judging these risks, my knowledge fails.”. This scale measures two concepts of information sufficiency namely ‘Current knowledge’ and ‘Information need’. These items were also based on an information-sufficiency questionnaire by Ter Huurne (2008) (see Appendix E). Cronbach’s Alpha was $\alpha = .34$. Therefore, the item “ I require a lot of information to judge the risks I am exposed to.” was deleted so that the alpha value has increased to $\alpha = .51$. Because Cronbach’s Alpha is not that robust for scales with a small amount of items, it was chosen to measure the reliability of the information sufficiency scale with Guttman’s Lambda 2. After two more items were deleted, the reliability of this scale is $\lambda_2 = .64$. Risk-perception was measured with items based on the risk behavior diagnosis scale by Witte, McKeon, Cameron and Berkowitz (1995). Examples of the six items are “I believe that the emergency is severe.” and “It is likely that I will get affected by the emergency”. (Appendix F). This questionnaire has a Cronbach’s Alpha value of $\alpha = .81$.

Results

Means and Standard Deviation

The average scores on all Likert-scales were moderately high. Scores on sensation seeking ($M = 4.44$, $SD = 1.1$), information sufficiency ($M = 4.12$, $SD = 0.97$) and self-efficacy ($M = 4.62$, $SD = 1.14$) were similar while scores on risk perception were slightly higher with a mean of $M = 5.19$ and a standard deviation of $SD = 0.90$

Correlations

To test if the constructs sensation seeking, risk perception, information sufficiency and self-efficacy correlate with each other, a bivariate Pearson correlation analysis was conducted. Correlations among those variables were very low. Only information sufficiency showed a significant correlation with self efficacy, $r = .26, p = .004$. The demographic variables also did not have a high overall correlation with the other concepts. (for a summary of the correlations see table 1).

Table 1
Correlations

Variables	1	2	3	4	5	6	7	8
1. Gender	-	-.11	-.05	-.11	.17	.14	.08	-.03
2. Age	-.11	-	.32**	.13	-.10	-.21*	-.20*	-.03
3. Education	-.05	.32**	-	.22*	-.15	.01	-.04	-.01
4. Place	-.12	.10	-.15	-	-.25**	-.07	.07	-.01
5. Risk perception	.17	-.10	-.15	-.25**	-	.07	-.07	-.03
6. Sensation seeking	.14	-.21*	.01	-.07	.07	-	.09	-.03
7. Information sufficiency	-.03	-.03	-.01	-.01	-.03	-.03	-	.28**
8. Self-efficacy	.08	-.20*	-.04	-.07	.07	.09	.28**	-

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

ANOVA

To test if the scores on sensation seeking, risk perception, information sufficiency and self-efficacy differ between the two conditions, a two-way ANOVA was conducted. No significant difference between the conditions was found for sensation seeking ($F(1,118) = 1.14, p = .29$), risk perception ($F(1,117) = 0.78, p = .39$), information sufficiency ($F(1,121) = 0.271, p = .60$) and self-efficacy ($F(1,120) = 1.94, p = .17$).

Regression

Several multiple regression analyses were conducted to predict risk perception, information sufficiency and self-efficacy based on the personality trait sensation seeking and demographic variables. No significant results were found for risk perception ($\beta = .07, t(114) = 0.78, p = .44$), information sufficiency ($\beta = -.03, t(117) = -0.33, p = .75$), self-efficacy ($\beta = .09, t(116) = 0.92, p = .36$). The demographic variables gender, place, level of education and age were also no significant predictors for the variables risk perception, information sufficiency and self-efficacy.

Additional Analysis

The Pearson correlation, ANOVA and regression analysis showed that the results for the variable information sufficiency stand out among the other variables. To test whether this questionnaire measures one concept, an inter-item correlation was conducted. Several items have a correlation of $r < 0.3$ which indicates that the items do not measure the same construct. Particularly the item 'I should know everything about changes or accidents regarding this

topic in my surroundings' shows a very low correlation with the other three items in this questionnaire (for the summary of correlations see table 2).

Table 2

Inter Item Correlation Matrix

<i>Item</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
1. I know a lot about this emergency at the moment.	-	.48	0.01	.09	.27
2. I know to which risks I am exposed to.	.48	-	-.25	.01	.36
3. I require a lot of information to judge the risks I am exposed to.	.01	-.25	-	.28	-.31
4. I should know everything about changes or accidents regarding this topic in my surroundings.	.09	.01	.28	-	.01
5. When it comes to judging these risks, my knowledge fails. (reversed)	.27	.36	-.31	.01	-

Discussion

The aim of this study was to investigate the relationship between sensation seeking and risk perception, information sufficiency and self-efficacy in an hypothetical emergency situation. Furthermore, it was attempted to show a difference between these variables in a condition with relatively little information over the emergency and a condition with more detailed information.

Unfortunately, the statistical analyses show that none of the hypotheses can be confirmed. The level of sensation seeking does not predict risk-perception, self-efficacy and information sufficiency in the two conditions. Moreover, there are no significant differences in scores between the two conditions. A possible explanation for these insignificant results could be a combination of conceptual and methodological errors. It is possible that sensation seeking cannot be used as a good predictor of risk perception, information sufficiency and self-efficacy in such an emergency situation as described in the vignette. Current research shows that high levels of sensation seeking are linked to risky behavior including alcohol consumption or reckless driving, but this character trait might play a different role in an urgent risk situation such as a chemical fire as described in the NL-Alert message and the Facebook post (Appendices A and B). The difference between risky behavior such as alcohol consumption and dangerous sport is that the possible negative consequences would appear in the future when drinking alcohol, while the negative consequences would be present immediately when performing dangerous sports. Borrelli, Hayes, Dunsiger and Fava (2010) suggest that a difference should be made between future and current risk perception. It is therefore unclear if sensation seeking is a good predictor for risk perception, information sufficiency and self-efficacy in emergency situations. It is possible that this character trait is only a good predictor for situations in which possible negative consequences appear much later or in situations where the individual has a free choice to participate. Emergency situations as described in the vignette are very different from this, because the individual does not choose to deal with the risks voluntarily. To personalize warning messages, it might be better to choose for another personality trait that is related to resilience in emergency situations.

Another reason for the insignificant results could be that it was difficult for the respondents to imagine themselves in a crisis situation, when they have probably never experienced something similar. There was only little information given in the vignette, so that the results might say little over the feelings one would have in a real emergency situation. Another problem in this study were language problems. The entire survey was only available in English, but from feedback of respondents, it became obvious that it was sometimes difficult to understand every word in the questionnaires because the majority of respondents are not native English speakers. This might also be an explanation for the relatively low Cronbach's alpha and low inter-item correlation of the information sufficiency scale. In further research, this questionnaire should be replaced by a more understandable version. Only two items remained from this scale for analysis, so it is likely that information sufficiency was not measured in full scope. Additionally, it should be tested if the information sufficiency scale does indeed only measure information needs and current knowledge or if it measures additional concepts. The inter-item correlation matrix shows that the two items for information need do correlate slightly higher with each other compared to the items measuring current knowledge. However, the overall correlation among the items remains low.

The sensation seeking questionnaire was given to the respondents at the beginning of the experiment, followed by the NL-Alert message and the Facebook Post. It is possible that this caused a response bias, because the participants consciously or subconsciously wanted their answers on the last three questionnaires to be consistent with their answers on the sensation seeking questionnaire. To prevent this bias, the study could have been split up in two parts instead of one so that the sensation seeking questionnaire would not be given to the

participants at the same time than the others, but for example a few days before. Improving these parts of the research design and materials could improve the results of this experiment.

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Appendix A

NL-Alert message on mobile phone



Appendix B

Facebook Post in condition 2

**RTL Nieuws**
3 hrs · 🌐

An explosion and subsequent massive fire at a chemical plant that distributes chemicals, plastics, and composites sent workers scrambling and businesses nearby into a panic.

According to the company, chemicals were being unloaded from a rail-car when the explosion occurred. The rail car contained highly flammable, toxic chemicals.
Smoke and flames could be seen for miles for much of the afternoon.

The local Fire Department strongly advises everyone to avoid the area and keep doors and windows shut.

The cause of the accident is still under investigation.



Explosion and fire in nearby chemical plant. According to the company, chemicals were being unloaded from a rail-car when the explosion occurred. The rail car...

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Appendix C

Brief Sensation Seeking Scale

1. I would like to explore strange places
2. I get restless when I spent too much time at home
3. I like to do frightening things.
4. I like wild parties.
5. I would like to take off on a trip with no pre-planned routes or timetables.
6. I prefer friends who are excitingly unpredictable
7. I would like to try bungee jumping.
8. I would love to have new and exciting experiences, even if they were illegal.

Appendix D

Information sufficiency scale

Current knowledge

1. I know a lot about this emergency at the moment.
2. I know to which risks I am exposed to.
3. When it comes to judging these risks, my knowledge fails.

Information need

4. I require a lot of information to judge the risks I am exposed to.
5. I should know everything about changes or accidents regarding this topic in my surroundings.

Appendix E

Self-efficacy scale

1. I would be able to protect myself against the possible consequences of exposure to toxins.
2. I would be able to do what I have to do when I hear about a release of toxins in my surroundings.
3. I would be able to react the right way if an accident happens.
4. I would be able to get and make sense of information about this emergency.

Appendix F

Risk Perception scale

1. I believe that the emergency is severe.
2. I believe that the emergency has serious negative consequences.
3. I believe that the emergency is extremely harmful.
4. It is likely that I will get affected by the emergency.
5. I am at risk for getting in contact with the toxins released by the fire.
6. It is possible that the emergency has negative consequences for my health.

