



# Making it stick: Exploring the effects of information and behavioral training on self-protectiveness of citizens in a real-life safety setting



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## ARTICLE INFO

### Keywords:

Real-life risk  
Behavioral training  
Efficacy beliefs  
Self-protective behavior

## ABSTRACT

This study contributes to our knowledge of whether and why citizens engage in self-protective behavior with regard to a real-life risk (the transportation of chemical substances by train). We assume that the way in which relevant risk information is processed, actively vs. passively, is a crucial factor. We hypothesize that behavioral training on self-protectiveness (the active approach) will increase respondents' perceived feasibility (self-efficacy) and the expected usefulness (response-efficacy) of risk-mitigating options to a larger extent than the passive approach (merely read about it). We subsequently propose that behaviorally trained participants will show more self-protectiveness than merely informed participants. Both groups are also compared to an uninformed control group.

First, a behavioral-training-effectiveness-study was conducted in order to explore whether the training developed led to an increase in participants' efficacy beliefs and self-protectiveness ( $N = 47$ ). Second, in our main study we took a random sample from the town's population ( $N = 614$ ) and tested if the instructional method (behavioral training vs. information only vs. no information) is a predictor of efficacy beliefs and self-protectiveness.

As expected, the instructional method used and the level of perceived response-efficacy positively influence self-protectiveness. Behaviorally trained respondents perceived risk mitigating options as more useful and showed more self-protectiveness than merely informed and uninformed participants. Furthermore, response-efficacy turned out to be a partial mediator between instructional method and self-protectiveness. Self-efficacy did not significantly predict self-protectiveness in this study.

This study demonstrates that using appropriate risk communication tools is crucial in order to increase self-protective behavior of citizens.

## 1. Introduction

Around the world, citizens are faced with many low-probability high-consequence risks. One example of such a risk is the transportation of highly dangerous chemical substances by train. The likelihood of the occurrence of such a serious incident is fairly small and many high quality precautionary measures are being taken by the government to diminish the potential threat (Ministry of Infrastructure and Environment, 2014). However, the consequences of a serious incident – as for instance illustrated by the effect of the fatal freight train crash in the Belgian municipality Wetteren in 2013 – can be severe and quick and accurate responses of citizens are crucial since early threat detection might give those at risk important additional time (NOS, 2014). Therefore, in mitigating the potential outcomes of low-probability high-consequence risks, the importance of individual citizens'

responsibilities in taking risk-preparatory action is stressed. In addition to the already existing precautionary measures, protection of the public is best served by encouraging additional self-protective measures and resilience. Also in other safety fields where individuals' behavior is a key element in reducing possible negative consequences of risks – such as for instance health safety and occupational safety – insight in factors that stimulate the adoption of adequate risk behaviors is necessary. Since inadequate behavior of individuals in these fields might also lead to injuries and even fatalities (Eurostat, 2013; Silva et al., 2017), individuals should undertake self-protective actions in order to reduce potential negative risk outcomes.

In order to seek for determinants influencing adequate risk behavior of citizens, self-protectiveness has emerged as an important topic within the risk communication literature (e.g. ter Huurne and Gutteling, 2008; Terpstra, 2010; Kievik and Gutteling, 2011; Kievik et al., 2012). Several

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studies have been conducted within the safety domain looking at the determinants of persuasion of the at-risk audiences, stimulating the adoption of self-protective behavior. These studies show that perceived feasibility (self-efficacy) and usefulness (response-efficacy) of self-protective behaviors are, besides risk perception, important predictors of self-protectiveness (Kievik and Gutteling, 2011; Lindell and Perry, 2012).

However, some pieces of the puzzle are still missing. We still do not know when an individual perceives risk mitigating options as feasible (self-efficacy) and useful (response-efficacy). This calls for a better understanding of the factors that influence the perceived feasibility and usefulness of risk mitigating options and how these factors ultimately affect individuals' behavioral adaptations in the face of a specific risk. Although research shows that citizens perceiving risk mitigating options as more feasible and useful are more likely to undertake adequate self-protective measures (e.g. Kievik and Gutteling, 2011; Lindell and Perry, 2012), we still do not understand when and why levels of self- and response-efficacy are most optimally stimulated.

In this study, we propose that actively processing relevant risk information might be the missing piece to our puzzle. In most studies on self-protective behavior, the results are based on responses of respondents after receiving mere information only (e.g. Kievik and Gutteling, 2011; Kievik et al., 2012; Lindell and Perry, 2012). Although providing information seems promising, this rather passive approach does face possible limitations: during stressful events declarative knowledge (facts) must be remembered and then transferred into action (Burke and Hutchins, 2007). During highly stressful situations such as incidents with freight trains transporting highly dangerous chemical substances, declarative memory may not be activated as easily as procedural knowledge (de Quervain et al., 1998; Kuhlmann et al., 2005). Procedural knowledge is defined as knowing how to perform a certain task and can be acquired through behavioral training (Anderson, 1982; Tulving, 1983). Increasing the levels of procedural knowledge (instead of declarative knowledge only) seems to be beneficial in such situations. This might lead to more knowledge on how to perform a certain task, which is necessary in order to behave adequately during highly stressful situations such as disasters (Tulving, 1983). Previous research in different safety domains shows that self-protective behavior can be more effectively trained through highly engaging measures such as behavioral trainings (Burke et al., 2011). For instance, research in the field of occupational safety shows that trainings in which participant-interaction is actively stimulated and in which trainees are asked to practice relevant risk behaviors, are particularly effective (Glendon et al., 2006). Behavioral trainings increase knowledge and adequate risk mitigating behaviors of participants. During a behavioral training, participants are far more likely to remember the presented information when compared to passive forms of communication such as only hearing words or reading the relevant material (Glendon et al., 2006). Not only will the level of procedural knowledge increase making the behavior a routine activity, the behavioral training will also increase perceived levels of feasibility and usefulness (Sitzman, 2011). When citizens engage in relevant risk mitigating behavior during a behavioral training, they receive important feedback on how easily these self-protective measures can be executed and how these behaviors reduce the threat. Training these risk mitigating behaviors in a real life setting thus increases citizens' understanding of the usefulness (the level of perceived response-efficacy) and feasibility (the level of perceived self-efficacy) of such behaviors (Kinatader et al., 2013).

In the current study, we propose that behavioral training (an active way of processing information) is a key element in enhancing citizens' procedural knowledge as well as their perceived levels of self-efficacy and response-efficacy and, subsequently, their self-protective behavior.

## 2. Theory and hypotheses

Over the last few years, some studies have contributed to our

understanding why citizens do, or do not, engage in self-protective actions with regard to safety risks (Terpstra and Gutteling, 2008; Kievik and Gutteling, 2011; Kievik et al., 2012). Firstly, the level of risk perception is an important predictor of adequate risk behavior. Moderate to high levels of risk perception are seen as necessary conditions for individuals to take action (Larsman et al., 2012). This might be one explanation for the lack of motivation to take precautionary measures among residents (Miceli et al., 2007). Secondly, both self-efficacy and response efficacy are significant predictors of self-protectiveness. Following Bandura (Bandura, 1991), self-efficacy can be defined as "people's beliefs about their capabilities to exercise control over their own level of functioning and over events that affect their lives" – or the level of perceived feasibility. Response efficacy is defined as the belief that a specific response will help effectively diminish a certain risk (Bandura, 1986) – or the perceived usefulness of risk mitigating behavior. Research shows that, when citizens do not know whether they are capable of executing actions that may reduce their vulnerability to risks (low level of self-efficacy), and they are uncertain that advised actions may be effective in mitigating the threat (low level of response-efficacy), they will not engage in risk mitigating behavior (Rimal and Real, 2003; Gore and Bracken, 2005; Kievik and Gutteling, 2011).

According to the Extended Parallel Process Model (EPPM) (Witte, 1992) the combination of elevated levels of risk perception, self-efficacy, and response-efficacy would motivate people to adopt self-protective measures. The more individuals believe they are susceptible to a serious threat, the more motivated they are to evaluate the efficacy of the recommended response. If the threat is perceived as irrelevant or insignificant, then there is no motivation to further process the message, and people will simply ignore the message. In contrast, when a threat is believed to be serious and relevant, individuals may become motivated to take some sort of action to reduce the induced level of fear (Witte and Allen, 2000).

The EPPM further predicts that perceived self-efficacy and response-efficacy jointly determine whether people will become motivated to control the danger or control their fear about the threat. Under these conditions, people carefully think about the recommended responses advocated in the persuasive message and adopt those as a means to control the danger. Alternatively, when people are uncertain about the effectiveness of recommended actions (i.e., the advice is perceived as low on self-efficacy and/or response efficacy), they are motivated to control their fear through denial, defensive avoidance, or reactance (Witte and Allen, 2000).

Recently, studies within the safety domain show evidence supporting these assumptions. For instance, the Protective Action Decision Model shows that threat perceptions as well as protective action perceptions are important predictors of self-protective behavior. Higher levels of self-protectiveness were seen among citizens who perceived a certain risk as risky and felt that protective actions were useful and feasible (Lindell and Perry, 2012). Furthermore, a study conducted by Kievik and Gutteling (2011) on flooding preparedness showed that higher levels of self-protectiveness are indeed seen when respondents have both high levels of risk perception as well as high levels of efficacy beliefs. Perceiving a risk as threatening and judging risk-mitigating options as both feasible and useful, leads to the intention to engage in self-protectiveness.

However, other studies on the intentions of citizens to engage in self-protectiveness with regard to severe weather circumstances (van Leeuwen, 2012) and citizens' behavior during crisis situations (Gutteling and de Vries, 2016), show that efficacy beliefs were insignificant predictors of adequate risk behavior. These studies show that stressing the fact that certain behavior is adequate in mitigating a threat does lead to a slight increase in perceived efficacy. However, although a significant change in perceived efficacy was found, the average scores on efficacy beliefs – even after this increase – were relatively low (around 3 on a scale from 1 to 5). Other studies that did find an effect of efficacy beliefs on self-protectiveness reported much higher scores on

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