The Role of Cognitive Appraisals and Past Protective Behavior in Future Protection Motivation: Applying Protection Motivation Theory to the COVID-19 Pandemic

Master's Thesis

Rieke Schmees

Department of Behavioral, Management and Social Sciences
Psychology of Conflict, Risk and Safety
University of Twente, Enschede
1st supervisor: Dr. Margôt Kuttschreuter
2nd supervisor: Dr. Ir. Peter de Vries

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Abstract

Past research found evidence for the role of risk perceptions and coping appraisals in people's motivation to engage in protective behaviors during crises. The current study aims to investigate people's threat and coping appraisals, based on *Past Protection Motivation Theory*, and examine the impact of past protective behavior on people's future protection motivation during the COVID-19 pandemic. A German sample (n = 275) completed a self-constructed online questionnaire on their risk perceptions, coping appraisals, their past protective behaviors and their future intentions to engage in protective behaviors during the pandemic. The relationships between threat and coping appraisals with people's intention to engage in future protective behavior, and the moderation effects of past protective behavior were assessed with correlation and multiple regression analyses. All of the threat and coping appraisal variables were significantly related to people's intention to engage in protective behavior. When assessing the impact of each appraisal process on protection motivation, only perceived severity, perceived vulnerability, response costs and response efficacy were found to be predictive for intention. Past protective behavior was found to strongly predict people's future protection motivation. A moderation effect of past protective behavior was only found between self-efficacy and people's intention to engage in protective behavior. Past protective behavior did not moderate the relationship between all other threat/coping appraisal variables and people's future protection motivation. Future research could conduct longitudinal studies to more accurately investigate the interplay between cognitive appraisals and behavior, with internal (e.g. habits) and more external factors (e.g. social media).

Key words: Protection motivation theory, PMT, threat appraisal, coping appraisal, past behavior, risk perception, pandemic, SARS-CoV-2 pandemic, COVID-19 pandemic

The Role of Cognitive Appraisals and Past Protective Behavior in Future Protection Motivation: Applying Protection Motivation Theory to the COVID-19 Pandemic

In December 2019, the corona virus disease COVID-19, caused by a newly discovered form of corona virus, called Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2), was detected in Wuhan, China, and quickly began spreading across the world within a few months. This led to millions of people infected and death rates rising, even after more than ten months after the first case was reported (European Centre for Disease Prevention and Control, 2020). Experts expect the pandemic to last at least until an appropriate vaccine is developed, which could take up to 18 months after the virus was detected (Grenfell & Drew, 2020). Generally, COVID-19 is a highly contagious, but mild viral infection of the mouth, nose, throat and lung, with 20-30% of diagnosed patients hypothesized to be hospitalized, and approximately 4% severely affected (European Centre for Disease Prevention and Control, 2020). Elderly people and those with certain chronic diseases such as cardiovascular disease, respiratory disease, diabetes or cancer are at risk for developing a severe illness, possibly leading to death, after becoming infected with COVID-19 (WHO, 2020a).

As of today, December 8, 2020, around 1,523,656 deaths and 68,872,391 confirmed COVID-19 cases are reported across the world, and the COVID-19 pandemic is currently growing at an accelerating pace (WHO, 2020b). The pandemic does not only substantially affect the healthcare system, but also bears economic impact on the large scale, such as a current global recession lasting for months and rising unemployment rates (Carlsson-Szlezak, Reeves, & Swartz, 2020), as well as social unrest and political tensions (Rosenfeld & Lopez, 2020). Generally, the threat of global pandemics is increasing and becoming more prevalent in the near future, highlighting the importance of all-time pandemic preparedness in society (Blake, Blendon, & Viswanath, 2010). In times of a pandemic, encouraging the public to engage in protective behaviors was found to be a particularly effective method to minimize the spread of the virus (Xu & Peng, 2015), thus, investigating determinants to engage in protective behaviors would be crucial. At this point, research investigating the use of protective behavior in pandemics is available (e.g. Perlroth et al., 2010; SteelFisher et al., 2012; Wise, Zbozinek, Michelini, Hagan, & Mobbs, 2020), and further research points towards the investigation of cognitions, such as efficacy beliefs and risk perceptions, to predict such protective behaviors (e.g. Brewer et al., 2007; Hagger et al., 2020; Walrave, Waterloos, & Ponnet, 2020). However, as less is known about how people's cognitions relate to actual behavior during a global pandemic, such as the current COVID-19 pandemic, this will be investigated in the following study.

Theoretical Framework

Use of Protective Measures

Several strategies, applied by individuals in everyday life, can be used to prevent and contain the spread of illnesses during pandemics (Xu & Peng, 2015), like pharmaceutical drugs, and the engagement in safety behaviors, such as social distancing and regular personal hygiene, among others (CDC, 2011; Juckett, 2006). Engaging in social distancing practices (Perlroth et al., 2010) and wearing facemasks (Suess et al., 2012) were found to be particularly cost-effective strategies to minimize disease transmission during pandemic outbreaks, especially when no virus-specific vaccination is available (Qualls et al., 2017). Such behaviors can also be conducted simultaneously to mitigate the effects of the virus (Oshitani, 2006). During the COVID-19 pandemic, citizens in Germany are encouraged by the government to engage in self-isolation and social distancing practices at home or admit to healthcare services when suspecting a COVID-19 infection (European Centre for Disease Prevention and Control, 2020). To ensure that such safety measures are followed, adequate communication between government and the public is crucial (Lin, McCloud, Jung & Viswanath, 2018).

Research found that people are generally willing to engage in protective response strategies, such as social distancing, when it does not negatively affect other aspects of their lives, such as work (Blendon et al., 2008). In fact, how people adapt to such global crises is largely determined by their attitudes and beliefs towards the threat, as well as the extent to which authorities encourage protective behavior (Lin et al., 2018). For instance, during the current COVID-19 pandemic, people engaged in more handwashing behavior, social isolation and a higher preoccupation with sanitization and social distancing behaviors after they have been told to do so by authorities (Wise et al., 2020). Similarly, adoption of protective behaviors seems to be very much related to people's attitudes and beliefs towards the risk of contracting COVID-19 (e.g. Dai et al., 2020).

Protection Motivation Theory

To understand people's underlying motivations of engaging in protective behaviors during pandemics, a comprehensive psychological model is needed. *Protection Motivation Theory* (PMT, Rogers, 1983) has been developed to predict protective behaviors in multiple contexts, such as alcohol consumption, nutrition and smoking, but also illness prevention (e.g. Al-Rasheed, 2020; Bish & Michie, 2010; Floyd, Prentice-Dunn, & Rogers, 2000; Milne, Sheeran, & Orbell, 2000; Sharifirad, Yarmohammadi, Sharifabad, & Rahaei, 2014). PMT assumes that individuals adopt certain cognitive belief patterns in order to protect themselves

from danger in uncertain contexts. It includes two components, that is, threat appraisal and coping appraisal. When a threat occurs, people evaluate it based on its severity and their vulnerability towards the threat, which is represented by threat appraisal. Coping appraisal describes how people respond, or cope, with the threat (Rogers, 1983). Both appraisal processes determine people's motivations to engage in measures that protect themselves from the risk, however, coping appraisal processes are more strongly related to protection motivation compared to threat appraisal processes (Al-Rasheed, 2020; Barati et al., 2020; Floyd et al., 2000; Kok et al., 2010; Sheeran & Orbell, 2002; Teasdale, Yardley, Schlotz, & Michie, 2012; Walrave et al., 2020; Xiao et al., 2014). Generally, an individual is most likely to engage in protective behaviors when the individual evaluates the threat as severe, perceives himself or herself as vulnerable to the threat, feels capable to engage in the recommended response and views the response as effective and the associated barriers to engage in protective behaviors as low (Milne et al., 2000). Notably, studies based on PMT mostly looked at self-reported or observed behavior and people's intention to engage in protective behavior, rather than actual behavior (e.g. Floyd et al., 2000; Milne et al., 2000; Norman, Boer, & Seydel, 2005).

Threat Appraisal. Risk perceptions are defined by people's subjective judgment of a risky situation or event (Slovic, 1987), and they play a large role in influencing people's health-related behaviors during crises, such as the current COVID-19 pandemic (e.g. Dai et al., 2020). According to Floyd et al. (2000), the intention to engage in a certain behavior derives from the perception of a threat, with the ultimate goal of avoiding such threat. Therefore, threat appraisals are positively related to the intention to engage in protective behaviors (Al-Rasheed, 2020; Bish & Michie, 2010; Brewer et al., 2007; Floyd et al., 2000). The PMT threat appraisal process includes *perceived severity* and *perceived vulnerability* as components of risk perception. *Perceived severity* defines the degree to which the individual believes the threat to seriously affect his or her life, while *perceived vulnerability* defines the susceptibility an individual perceives towards a threat (Rogers, 1975). Earlier research during the 2009 H1N1 influenza pandemic, and the current COVID-19 pandemic found that risk perception is positively related to responsive behavior during pandemics (Al-Rasheed, 2020; Cowling et al., 2010; Ibuka, Chapman, Meyers, Li, & Galvani, 2010; Jose, Narandran, Bindu, Beevi, & Benny, 2020; Kaspar, 2020; Shahnazi et al., 2020; Tooher, Collins, Street, Braunack-Mayer, & Marshalla, 2013; van der Weerd, Timmermans, Beaujean, Oudhoff, & van Steenbergen, 2011).

Several factors could potentially influence people's risk perceptions over time (Lin et

al., 2018). People may have a sense of subjective uncontrollability and a higher risk perception for large-scale events that affect a lot of people at once, and they may also perceive events that have no benefit for them as particularly harmful (Slovic, 1987). The fact that COVID-19 is a novel virus for which no vaccine is available at the moment (Grenfell & Drew, 2020) could further add to people's risk perception. Moreover, the vast amount of information people are provided with during a pandemic, through several institutional sources, such as media, the government and people's closer social network, further increase people's risk perceptions and are linked to the use of protective measures (van der Weerd et al., 2011). For instance, social networks may very much influence people's health and social-distancing behaviors (Lin et al., 2018). Earlier research also found that prior personal experiences with illnesses increase risk perceptions (Öhman, 2017). Therefore, people who have been previously infected with an illness or were in close contact with people who have been infected earlier, could have higher risk perceptions of future illness infection, and a higher intention to engage in protective behaviors in the future.

Coping Appraisal. The coping appraisal component of PMT includes *response efficacy, self-efficacy* and *response costs,* and it describes an individual's evaluation of a recommended coping response to a certain threat (Rogers, 1975). Evaluation of the threat as part of the coping appraisal process may result in intentions that lead to either adaptive or maladaptive coping (Rogers & Prentice-Dunn, 1997*).*

Response efficacy, which was originally defined by Rogers (1983) to play the most important role in coping appraisal, describes the belief that a certain adaptive response will be successful, that is engaging in the protective behavior can effectively protect the self and other people (Floyd et al., 2000). *Self-efficacy* entails the belief that a person can perform the recommended health behavior, and it increases the likelihood that a person will be able to successfully execute a behavior (Floyd et al., 2000). The importance of self-efficacy in people's intention to adopt protective behavior was supported in earlier research (Bandura, 1977; Brewer et al., 2007; Strecher, DeVellis, Becker, & Rosenstock, 1986; Teasdale al., 2012), and also during the COVID-19 pandemic (Barati et al., 2020). A similar robust effect was found for the relationship between response efficacy and intention to engage in protective behavior (Al-Rasheed, 2020; Brewer et al., 2007; Janz & Becker, 1984; Kaspar, 2020; Rosenstock, 1974; Williams, Rasmussen, Kleczkowski, Maharaj, & Cairns, 2015).

Response costs entail beliefs about the individual's costs of engaging in a recommended response (Rogers, 1983). During crises, possible response costs could be the lack of financial means, or basic necessities that could prevent people from engaging in

protective behavior. Previous research suggests that such response costs play an important role in protection motivation, in crises, and particularly pandemics (Barati et al., 2020; Coe Gatewood, Moczygemba, Goode, & Beckner, 2012; Janz & Becker, 1984; Teasdale et al., 2012).

Although there is moderate support for all PMT variables to predict the use of protective measures, in both longitudinal and correlational studies, the strongest evidence was found for response- and self-efficacy (Al-Rasheed, 2020; Kaspar, 2020; Floyd et al., 2000; Milne et al., 2000; Norman et al., 2005; Sharifirad et al., 2014).

Fear. Past research has shown that people's protection motivation in crisis situations is not only influenced by threat and coping appraisals, but also by people's levels of fear (Bubeck, Botzen, & Aerts, 2012; Milne, Orbell, & Sheeran, 2002). *Fear* is defined as an emotional response that is evoked when a particular threat is present (Milne et al., 2002), and it may be strengthened through threat-related messages. *Fear* has not been included in the original version of PMT (Rogers, 1975), however, research in the field of risk perception during pandemics and other crises suggest it to be an important predictor for the use of protective behaviors (Bubeck et al., 2012; Zaalberg, Midden, Meijnders, & McCalley, 2009; De Zwart et al., 2009).

When people experience fear, their attention, comprehension and beliefs in persuasive messages increase, which increases the likelihood for an individual to engage in protective behavior to assimilate to the threat (Lazarus & Folkman, 1984). Past research has shown that fear could indirectly lead to behavioral intentions by altering threat and appraisal processes (Zaalberg et al., 2009) or directly predict protection motivation (Bubeck et al., 2012; De Zwart et al., 2009; Liao, Wu, Wing Tak Lam, Cowling, & Fielding, 2019). For instance, high levels of perceived vulnerability and severity have been found to increase fear, which in turn increased threat appraisal, leading to a higher protection motivation (Milne et al., 2000; Liu et al., 2016). Similarly, high levels of fear were associated with low levels of effective coping, or emotion-focused coping, leading to people being less likely to engage in protective behaviors (Huang, Lei, Xu, Liu, & Yu, 2020; Rahman et al., 2020).

Although some research already found fear to be related to protective behavior during the current COVID-19 pandemic (Oh, Lee, & Han, 2020; Yıldırım, Geçer, & Akgül, 2020; Zhong et al., 2020), the investigation of the relationship between fear and intention to engage in protective behavior has been generally less represented in previous literature.

Other variables. Demographic factors, such as age, sex, race and sociopsychological factors seem to have an impact on an individual's motivation to adopt government safety-

related measures by altering people's threat and coping appraisal. Higher socioeconomic status was found to be associated with higher levels of pandemic-related knowledge, and therefore a higher likelihood of using protective measures (Machida et al., 2020; Tooher et al., 2013). Moreover, risk perception and the use of protective measures in the COVID-19 pandemic tend to be higher for elderly people and women (Machida et al., 2020).

Past Use of Protective Behavior

Although cognitive theories such as PMT have already investigated the factors that play a role in people's use of protective measures in health-related contexts (Brewer et al., 2007), considering the effects of people's past protective behavior could substantially help to explain people's future protection motivation (Brown, Hagger & Hamilton, 2020; Hagger, Polet & Lintunen, 2018; Wise et al., 2020). Early research found that past behavior is maintained when people repeatedly engage in such behaviors, across stable settings and over an extended period of time (Ouellette & Wood, 1998). Consistent evidence found that past behavior is related to intentions and subsequent behavior, indicating that past behavior tends to be stable over time (e.g. Hennessy et al., 2010; Ouellette & Wood, 1998). Direct effects between past behavior on subsequent behavior were found to be due to implicit, or automatic processes. However, when associated with social cognitive processes, such as beliefs and cognitions, past behavior represents a more reasoned and deliberate process (Hagger, 2016). Past behavior was also found to influence the relationship between social cognitive constructs and subsequent behavior (Hagger, Chan, Protogerou & Chatzisarantis, 2016). During the COVID-19 pandemic, past protective behavior was found to be related to people's intention to engage in social distancing behavior in the future (Hagger, Smith, Keech, Moyers, & Hamilton, 2020), however, the relationship with behavior and social cognitive factors was not assessed.

The current study

Despite previous research already suggesting the importance of threat and coping appraisal as well as the role of fear in people's intention to engage in protective behavior during a pandemic, such as the current COVID-19 pandemic (e.g. Dai et al., 2020), less is known about how actual behavior, such as people's past protective behavior could help explain this relationship. Therefore, the current study attempts to investigate the relationship between the PMT constructs and people's *past protective behavior*, as well as their *intention* to engage in protective behavior in the future, during the current COVID-19 pandemic. The following hypotheses are made (see Figure 1):

H1: Individuals who score higher on *perceived vulnerability* show a higher intention to

engage in protective behavior.

H2: Individuals who score higher on *perceived severity* show a higher *intention* to engage in protective behavior.

H3: Individuals who score higher on *self-efficacy* show a higher *intention* to engage in protective behavior.

H4: Individuals who score higher on *response efficacy* show a higher *intention* to engage in protective behavior.

H5: Individuals who score higher on *response costs* show a lower *intention* to engage in protective behavior.

H6: Individuals who score higher on *fear* show a higher *intention* to engage in protective behavior.

H7: *Past protective behavior* moderates the relationship between threat appraisal variables and *intention*. This includes:

H7a: The relationship between *perceived vulnerability* and *intention* will be stronger for people who score high on *past protective behavior*.

H7b: The relationship between *perceived severity* and *intention* will be stronger for people who score high on *past protective behavior*.

H8: *Past protective behavior* moderates the relationship between the coping appraisal variables and *intention*. This includes:

H8a: The relationship between *self-efficacy* and i*ntention* will be stronger for people who score high on *past protective behavior*.

H8b: The relationship between *response efficacy* and i*ntention* will be stronger for people who score high on *past protective behavior*.

H8c: The relationship between *response costs* and *intention* will be weaker for people who score high on *past protective behavior*.

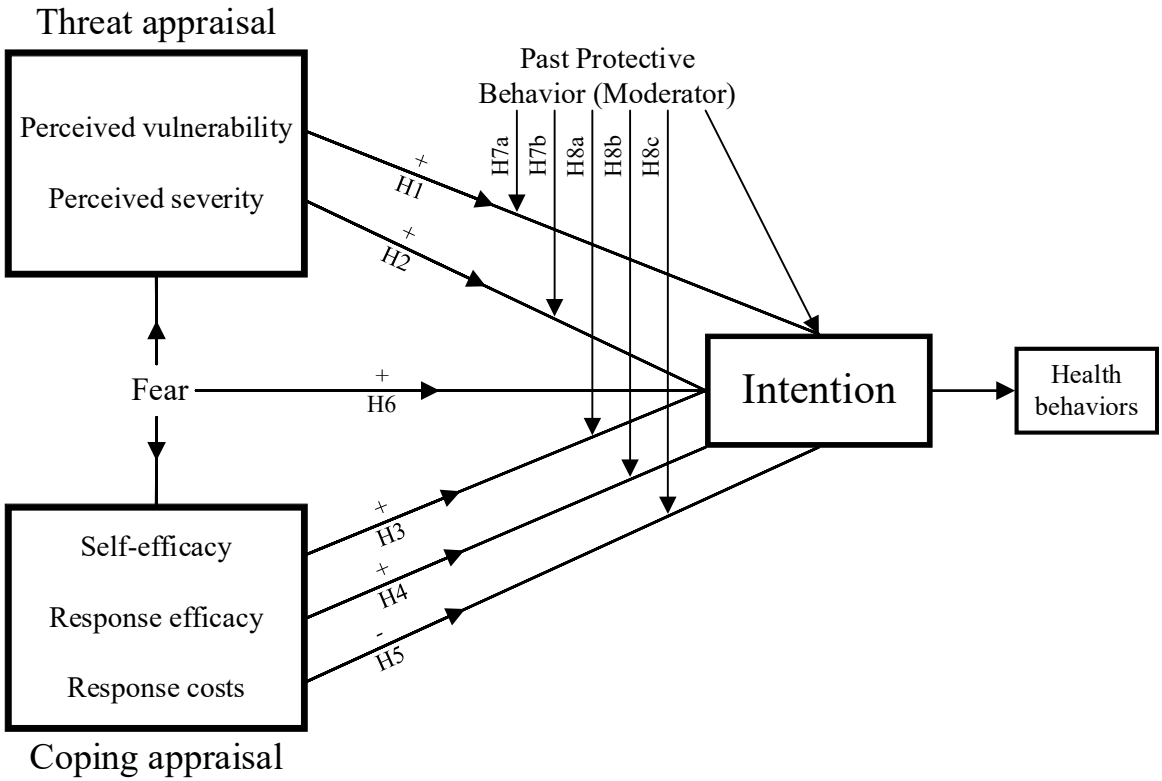

Figure 1. Hypothesized relationships between all variables.

Method

Participants

The online survey was completed by 275 respondents (74 male, 200 female, one unknown), with a mean age of 32 (95% CI [30.46; 33.63]). Most of the respondents were highly educated, with 70% of respondents holding a university degree. 82% of all participants were not or have not been infected with COVID-19 in the past, and 73% reported to not have people in their close environment who have been diagnosed with COVID-19. This indicates that most participants in the current study did not have experiences with COVID-19 at the time when they participated in the study. All respondents were sampled through convenience sampling on social media during the COVID-19 pandemic in Germany. For each participant completing the questionnaire, a small donation was given to the Corona Crisis Relief Funds in Germany.

To be included in the study, the participants were required to be German residents, be at least 16 years old and provide written consent prior to the study. In total, 25 respondents were excluded from the original dataset of 300 respondents. Six participants provided incomplete data, ten reported not to be German residents and nine did not want their data to be used for the purpose of the study.

Instruments

The questionnaire was part of a Master thesis project and contained a total of 45 self-report questions. Such questions were related to people's threat and coping appraisals to engage in protective behavior during the COVID-19 pandemic, past protective behavior, intention to engage in protective behavior in the future, sociodemographic factors and previous experiences with COVID-19 (see Appendix C). The questionnaire was translated from English to German (see Appendix D).

Protection Motivation Theory. The PMT constructs, that is, *perceived vulnerability, perceived severity, response efficacy, self-efficacy, response costs,* including *fear* were measured with 18 items. These items were originally developed by Milne et al. (2002) but adjusted to the COVID-19 pandemic, for the purpose of the current study. The questions were framed on a 5-point Likert scale (1 = *Strongly Disagree*, 5 = *Strongly Agree*). All of the PMT constructs were included as predictor variables. Item 1 for *self-efficacy* and *response costs*, which were originally reverse-coded, were transformed prior to the analysis. All of the PMT items had either an acceptable or good reliability of $0.7 \leq \alpha < 0.9$ (see Table 1). For *perceived severity*, *perceived vulnerability* and r*esponse efficacy*, the Kaiser-Meyer-Olkin (KMO) measure was acceptable (KMO = .50), and Bartlett's Test of Sphericity suggested significance at $\alpha = .05$ ($p = .00$), indicating that the items of the construct correlate with each other. The remaining PMT constructs further showed significance at $\alpha = .05$ ($p = .00$) for Bartlett's Test of Sphericity and high Kaiser-Meyer-Olkin values for *self-efficacy* (KMO = .74), *response costs* (KMO = .77) and *fear* (KMO = .82). The anti-image correlations of each of the PMT constructs suggested that all items are suitable for conducting an exploratory factor analysis, as they all passed the measure of sampling adequacy of > .5. The communalities of all items for each PMT passed the cut score of .2 (Child, 2006), suggesting that all items for each separate construct sufficiently correlate with each other (see Table 1).

Because it is assumed that the PMT constructs consist of underlying factors we cannot directly measure, Principal-axis factor extraction (PAF) was used, to assess the common factors. For *perceived severity*, the extracted factor accounted for 59% of the variance, based on Eigenvalue ≥ 1. For *perceived vulnerability*, the extracted factor accounted for 72% of the variance, based on Eigenvalue ≥ 1. For *fear*, the extracted factor accounted for 69%, for *response efficacy* 63%, for *self-efficacy* 46% and for *response costs* 46%, based on Eigenvalue ≥ 1. Table 1 further shows the rotated factor loadings for each PMT item. The Principal Axis Factor Analysis suggested one underlying factor for each of the PMT

variables, with all of the items underlying each construct indicating good internal reliability values (see Table 1). No items were removed after the analysis and the constructs remained the same.

Past Protective Behavior. *Past protective behavior* was included as a predictor variable, and the items were adopted from the Federal German Institute for Risk Assessment (BfR, 2020). *Past protective behavior* included seven items. The response options were framed on a 5-point Likert scale (1 = *Always*, 5 = *Never*). The items for *past protective behavior* showed an acceptable reliability (Cronbach's α = .76). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy suggested that each factor predicts a sufficient number of items, with a value of KMO = .81. The results for Bartlett's Test of Sphericity indicated significance at α = .05. (p = .00). The anti-image correlations passed the cut-score of > .5. The communalities passed the cut score of > .2 (see Table 1). Principal-axis factor extraction (PAF) suggested two underlying factors for *past protective behavior* (see Table 1). Based on Eigenvalue ≥ 1, these factors accounted for 40 % of the variance. According to the results of the PAF, Item 3, 5, 1 and 7 lay on the suggested factor 1, while items 2, 4 and 6 lay on factor 2 (see Table 1). Although two factors were proposed for *past protective behavior*, and the loadings were high on both factors, all of the items were necessary to measure the construct. No items were removed after the analysis and the constructs remained the same.

Intention to Engage in Future Protective Behaviors. *Intention* was included as an outcome variable and the items were adopted from the Federal German Institute for Risk Assessment (BfR, 2020). However, other than the BfR (2020) which originally only took past and present protective measures into account, the items were rewritten to cover *intention* to engage in protective behaviors, which included seven items. The response options were framed on a 5-point Likert scale (1 = *Always*, 5 = *Never*), and reverse-coded prior to the analysis. The items for *intention* have an acceptable reliability (Cronbach's α = .78). Results of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy indicated a sufficient number of items for the construct (KMO = .82). Bartlett's Test of Sphericity suggested significance at α = .05 (p = .00). The anti-image correlations all passed > .5, and the communalities passed > .2, indicating that all items sufficiently correlate with each other and were suitable for conducting a factor analysis. Principal-axis factor extraction (PAF) suggested two underlying factors for *intention* (see Table 1). PAF proposed items 3, 5, 7 and 1 to lay on factor 1, and items 6, 4 and 2 to lay on factor 2. Based on Eigenvalue ≥ 1, the factors related to *Intention* account for 46% of the variance. However, a one-factor approach seemed to fit better, as all of the items measured seemed to be necessary to measure the same

construct (see Table 1). Thus, no items were removed after the analysis and the constructs remained the same.

Previous experiences with COVID-19. Six items related to the respondent's illness status and previous infections of COVID-19 were included, both related to the individual and acquaintances. The items were adopted from the COVID-19 survey and guidance recommendations of the World Health Organisation Europe, and rephrased (World Health Organisation Europe, 2020c).

Sociodemographic items. In the first and last section of the questionnaire, seven sociodemographic items were included, related to age, gender, nationality, country of residence, marital status, educational level and occupation status.

Table 1
Principal Axis Factor Analysis: Rotated Factor Loadings, Communalities and Cronbach's α of Items of PMT Constructs, Past Protective Behavior and Intention

Items	Factor Loadings		Communalities	α
	Factor 1	Factor 2		
Past Protective Behavior				.76
Keeping distance to others	**.72**	.24	.58	
Complying with government regulations	**.57**	.17	.35	
Avoiding the public	**.49**	.21	.29	
Wearing protective clothing	**.42**	.32	.27	
Using disinfectants	.18	**.67**	.48	
Paying more attention to hygiene in general	.28	**.63**	.47	
Washing hands	.24	**.53**	.34	
Intention/Future Protective Behavior				.78
Keeping distance to others	**.76**	.20	.62	
Complying with government regulations	**.62**	.28	.46	
Wearing protective clothing	**.54**	.33	.40	
Avoiding the public	**.54**	.11	.30	
Paying more attention to hygiene in general	.23	**.77**	.65	
Using disinfectants	.20	**.64**	.45	
Washing hands	.20	**.57**	.37	
PMT Constructs	Factor 1	Factor 2		
Perceived severity				.75
Becoming infected with the novel coronavirus would be likely to cause me to become severely ill.	**.77**		.59	
If I were to become infected with the novel coronavirus, I would suffer a lot of pain.	.77		.59	
Perceived vulnerability				.84
I am likely to become infected with the novel coronavirus in the future.	**.85**		.72	

My chances of becoming infected with the novel coronavirus in the future are high.	**.85**	.72	
Response costs			.77
Engaging in protective measures during the next month would cause me too many problems.	**.75**	.56	
I would be discouraged from engaging in protective measures during the next month as it would take too much time.	**.72**	.51	
I would be discouraged from engaging in protective measures during the next month because I would feel silly doing so.	**.68**	.46	
The benefits of engaging in protective measures during the novel coronavirus pandemic outweigh the costs.	**.56**	.32	
Self-efficacy			.72
Engaging in protective measures during the next month is easy for me.	**.81**	.66	
I feel confident in my ability to engage in protective measures during the next month.	**.78**	.61	
I am discouraged from engaging in the protective measures during the next month because I feel overwhelmed to do so.	**.61**	.37	
It would not be difficult for me to engage in protective measures during the next month.	**.47**	.22	
Response efficacy			.77
Engaging in protective measures decreases my chances of becoming infected with the novel coronavirus.	**.79**	.63	
Because of the wide range of positive effects engaging in protective measures has for myself, it is a good way of reducing the risk of becoming infected with the novel coronavirus.	**.79**	.63	
Fear			.90
The thought of becoming infected with the novel coronavirus makes me feel worried.	**.90**	.80	
The thought of becoming infected with the novel coronavirus makes me feel frightened.	**.87**	.76	
The thought of becoming infected with the novel coronavirus makes me feel anxious.	**.86**	.74	
The thought of becoming infected with the novel coronavirus makes me feel scared.	**.67**	.45	

Procedure

At the beginning of the study, participants were informed about the purpose of the study and they were asked to give informed consent (see Appendix B). The participants were then asked to complete the questionnaire. At the end of the study, the participants were

debriefed (see Appendix E). The duration of completing the questionnaire was approximately five minutes. The study was approved by the Ethical Committee of the University of Twente (No. 200978).

Statistical Analysis

Testing Assumptions

To perform Pearson's correlation, the assumptions of normality, linearity and homoscedasticity were required to be met and the data should not have any outliers (Field, 2018). The histograms, the Shapiro-Wilk test and boxplots suggested a non-normal distribution and the presence of outliers, hence the assumption of normality was not met. Partial regression plots indicated a non-linear relationship, however, the scatterplot including the standardized residuals and the outcome variable showed homogeneity. As the assumptions related to normality, linearity and outliers were not met, Spearman's correlation was used. The findings were later compared to the Pearson's correlation coefficients, to examine whether they are approximately similar, and whether a parametric test could be used in the subsequent analyses. The assumptions required to use Spearman's correlation were that the data are ordinal, and the function is monotonic (Field, 2018). All assumptions were met. Spearman's correlation measure was used to assess the binary relationship between *perceived vulnerability* and *intention* (H1), *perceived severity* and *intention* (H2), *self-efficacy* and *intention* (H3), *response efficacy* and *intention* (H4), *response costs* and *intention* (H5) and *fear* and *intention* (H6).

Multiple linear regression analyses were conducted to assess the main effects between all variables and *intention*, and the two-way interactions between *past protective behavior* and *perceived vulnerability* (H7a) and *past protective behavior* and *perceived severity* (H7b), *past protective behavior* and *self-efficacy* (H8a), *past protective behavior* and *response efficacy* (H8b) and *past protective behavior* and *response costs* (H8c). Next to the assumption of linearity that was previously tested to run the correlation, the following assumptions were required to conduct multiple linear regression analyses (Field, 2018). The sample size was required to be sufficiently large, including at least 20 cases per predictor in the analysis. The predictor variables should have non-zero variances and no multicollinearity, and the residuals should be independent and normally distributed. The assumptions related to sample size and non-zero variances were met. All VIF values of the predictors were larger than 5, suggesting no multicollinearity between predictor variables. The results of the Durbin-Watson test suggested that for both the threat appraisal and coping appraisal variables the values were close to 2, indicating that the residuals were independent. The Q-Q plots suggested that the

errors for both the threat and coping appraisal variables were approximately normally distributed. All *p*-values in the current study were interpreted based on the cut-score $\alpha = .05$.

Results

Summary Statistics

Table 2 shows the means and standard deviations for all predictor variables, and Spearman's correlations between *perceived vulnerability*, *perceived severity*, *self-efficacy*, *response efficacy*, *response costs*, *fear, past protective behavior* and *intention*. Generally, *response efficacy* and *past protective behavior* had the highest ratings with scores high above the midpoint ($M = 4.17$, $SD = .73$; $M = 4.13$, $SD = .50$), which indicates that on average, the respondents reported to have frequently engaged in protective behavior in the past and they believed that engaging in protective behaviors would be helpful in avoiding the threat. The ratings for *self-efficacy* and *intention* were also considerably high ($M = 4.08$, $SD = .72$*;* $M = 4.01$, $SD = .53$), which indicates that respondents on average reported to feel able and willing to engage in protective behaviors. The means for *perceived vulnerability*, *fear* and *perceived severity* were slightly above the midpoint ($M = 2.84$; $SD = .90$*;* $M = 2.76$, $SD = .94$; $M = 2.60$; $SD = .84$), suggesting that the respondents reported to have experienced some fear and risk perception of COVID-19, however, those scores were not immensely high. *Response costs* had the lowest ratings, with the mean below the midpoint ($M = 1.75$; $SD = .66$), which indicates that respondents reported the perceived costs associated with engaging in the protective behavior as relatively low.

Hypotheses Testing

Correlation Analysis. Table 2 shows the Spearman's correlation coefficients. When investigating the correlations between the threat appraisal variables and *intention*, a significant positive correlation between *perceived vulnerability* and *intention* was found ($r_s = .19$, $p < .05$). This indicates that, as *perceived vulnerability* increases, *intention* increases. The hypothesis that individuals who score higher on *perceived vulnerability* show higher *intention* (H1), was supported. Further, *perceived severity* was found to be significantly related to *intention* ($r_s = .20$, $p < .05$), indicating that as *perceived severity* increases, *intention* increases. Therefore, the hypothesis that individuals who score high on *perceived severity* score higher on *intention* (H2) was supported.

For the correlations between the coping appraisal variables and *intention*, a significant relationship was found between *self-efficacy* and *intention* ($r_s = .24$, $p < .05$). This suggests that as *self-efficacy* increases, *intention* increases. The hypothesis that individuals who score high on *self-efficacy* score high on *intention* (H3) was supported. The results also indicate a

significant relationship between *response efficacy* and *intention* (r_s = .19, p < .05). Therefore, it was found that when *response efficacy* increases*, intention* increases as well, which supports the hypothesis that *response efficacy* and *intention* are positively related (H4). A statistically significant negative correlation was found between *response costs* and *intention* (r_s= -.26, p < .05), suggesting that as *response costs* increase, *intention* decreases. The hypothesis that individuals who score higher on *response costs* score lower on *intention* (H5) was supported.

A significant relationship between *fear* and *intention* (r_s = .28, p < .05) was also found. That is, as *fear* increases, *intention* increases as well, which confirms the hypothesis that individuals who score higher on *fear* score higher on *intention* (H6). All correlations were, however, weak.

When comparing Spearman's correlation coefficients with Pearson's correlation coefficients, the values were very similar between the non-parametric and the parametric procedure (see Appendix A). Regardless of using the parametric or the non-parametric correlation procedure, all predictor variables significantly correlated with *intention*, in the expected direction, and with a weak effect size. Therefore, we can assume that the results between both parametric and non-parametric statistical analyses were approximately equal, despite our data not meeting the required assumptions to conduct Pearson's correlation.

Table 2

Summary Statistics and Spearman's Correlation of the PMT variables, Fear, Past Protective Behavior and Intention (n=275)

Variable	*M*	*SD*	1	2	3	4	5	6	7	8
1. Perceived Vulnerability	2.84	.90	1.00							
2. Perceived Severity	2.60	.84	.11*	1.00						
3. Self-efficacy	4.08	.72	.07	-.01	1.00					
4. Response efficacy	4.17	.73	-.07	.06	.28**	1.00				
5. Response costs	1.75	.66	-.03	-.12*	-.61**	-.47**	1.00			
6. Fear	2.76	.94	.19**	.44**	.01	.22**	-.08	1.00		
7. Past Protective Behavior	4.13	.50	.08	.12*	.16**	.19**	-.22**	.23**	1.00	
8. Intention	4.01	.53	.19**	.20**	.24**	.19**	-.26**	.28**	.81**	1.00

Note. *Correlation is significant at .05 level (1-tailed).
**Correlation is significant at .01 level (1-tailed).

Multiple Regression Analyses. A multiple regression in which all variables were included was conducted to assess and compare the main effects of each predictor variable on *intention*. The model was overall significant, F (7, 267) = 108.10, $p < .05$, $R^2 = .74$, however, only *perceived vulnerability*, ($\beta = .09$, t (267) = 2.94, $p < .05$) and *past protective behavior* ($\beta = .79$, $t(267) = 23.04$, $p < .05$) were found to be predictive for *intention.* The effect was strong for *past protective behavior* and weak for *perceived vulnerability* (see Table 3).

In the following, the effects of the threat appraisal variables, that is *perceived severity* and *perceived vulnerability* on *intention* were assessed. Three separate multiple regression analyses were conducted, which included only the threat appraisal variables in the first analysis, the threat appraisal variables and *past protective behavior* in the second analysis, and the threat appraisal variables, *past protective behavior* and the interaction terms in the third analysis.

The model including *perceived severity* and *perceived vulnerability* explains a significant amount of variance in *intention*, F (2, 272) = 12.52, $p < .05$, $R^2 = .08$. Both *perceived severity* ($\beta = .23$, t (272) = 3.84, $p < .05$) and *perceived vulnerability* ($\beta = .15$, $t(272) = 2.63$, $p < .05$) significantly predicted *intention*, but the effects were generally weak.

When *past protective behavior* was added to the model, the model explained a significant amount of variance in *intention, F* (3, 271) = 244.16*, p* < .05, R^2 = .73. All of the predictor variables included in the model, that is *perceived vulnerability* (*ß* = .10, *t*(271) = 3.23, *p* < .05), *perceived severity* (*ß* = .08, *t*(271) = 2.44, *p* < .05) and *past protective behavior* (*ß* = .82, *t*(271) = 25.45, *p* < .05) were predictive for *intention.* The effect was strong for *past protective behavior*, and weak for *perceived vulnerability* and *perceived severity*.

When the interaction terms for the threat appraisal variables with *past protective behavior* were included in the model, the model remained significant overall, *F* (5, 269) = 146.62, *p* < .000, R^2 = .86. Table 4 shows the main effects and interaction effects when the interaction terms for the threat appraisal variables are included. There were significant main effects for *perceived vulnerability* (*ß* = .11, *t*(269) = 3.28, *p* < .05), *perceived severity* (*ß* = .09, *t*(269) = 2.61, *p* < .05), and *past protective behavior* (*ß* = .81, *t*(269) = 23.80, *p* < .05). The effects were strong for *past protective behavior* and weak for *perceived vulnerability* and *perceived severity*. The interaction between *perceived vulnerability* and *past protective behavior* (*ß* = .03, *t*(269) = .90, *p* > .05) was not significant. Therefore, the hypothesis that *past protective behavior* moderates the relationship between *perceived vulnerability* and *intention* was rejected (H7a). There was no significant interaction effect between *perceived severity* and *past protective behavior* (*ß* = -.05, *t*(269) = -1.21, *p* > .05), which indicates that the hypothesis that *past protective behavior* moderates the relationship between *perceived severity* and *intention* (H7b) was rejected.

In the following, the effects of the coping appraisal variables, that is *self-efficacy*, *response efficacy*, *response costs* and *past protective behavior*, on *intention* were assessed. Three separate multiple regression analyses were conducted, which included only the coping appraisal variables in the first analysis, the coping appraisal variables and *past protective behavior* in the second analysis, and the coping appraisal variables, *past protective behavior* and the interaction terms in the third analysis.

The model including only coping appraisal variables explained a significant amount of variance in *intention*, *F* (3, 271) = 14.68, *p* < .05, R^2 = .14. There were main effects for *response efficacy* (*ß* = .14, *t*(271) = 2.07, *p* < .05) and *response costs* (*ß* = -.24, *t*(271) = -3.06, *p* < .05), but no main effect for *self-efficacy* (*ß* = .06, *t*(271) = .85, *p* > .05). Both *response costs* and *response efficacy* had weak effects.

When *past protective behavior* was added to the model, the model explained a significant amount of variance in *intention, F* (4, 270) = 173.90*, p* < .05 R^2 *=.72.* There were no main effects for *self-efficacy* (*ß* = .07, *t*(270) = 1.65, *p* > .05) *response efficacy* (*ß* = .01,

t (270) = .15, *p* > .05) and *response costs* (*ß* = -.04, *t*(270) = -.88, *p* > .05). However, *past protective behavior* was found to be predictive for *intention* (*ß* = .86, *t*(270) = 23.68, *p* < .05). The effect for *past protective behavior* was strong.

When the interaction effects for all coping appraisal variables with *past protective behavior* were included in the model, the model remained overall significant, *F* (7, 267) = 101.23, *p* < .05, R^2 = .73. Table 5 shows the main effects and interaction effects when the interaction terms for the coping appraisal variables were included. No main effects were found for the coping appraisal variables *self-efficacy* (*ß* = .07, *t*(267) = 1.79, *p* > .05), *response efficacy* (*ß* = -.01, *t* (267) = -.14, *p* > .05) and *response costs* (*ß* = -.05, *t*(267) = -1.02, *p* > .05). However, a strong main effect was found for *past protective behavior* (*ß* = .81, *t*(267) = 21.80, *p* < .05). A significant interaction effect was found between *self-efficacy* and *past protective behavior* (*ß* = .08, *t*(267) = -.41, *p* < .05). The interaction is shown in Figure 2. The results of the interaction suggest that for people who scored high on *past protective behavior*, *self-efficacy* was more strongly related to *intention*, compared to people with moderate and low levels of *past protective behavior*, however, the difference was small. Therefore, the hypothesis that *past protective behavior* moderates the relationship between *self-efficacy* and *intention* in the expected direction was supported (H8a). The interaction between *response efficacy* and *past protective behavior* was not significant (*ß* = -.03, *t*(267) -.41, *p* > .05), leading to the hypothesis that *past protective behavior* moderates the relationship between *response efficacy* and *intention* to be rejected (H8b). The interaction between *response costs* and *past protective behavior* was not significant (*ß* = .02, *t*(267) = .24, *p* > .05). Therefore, the hypothesis that *past protective behavior* moderates the relationship between *response costs* and *intention* (H8c) was rejected. An overview of the assessed relationships between all variables is shown in Figure 2.

Table 3

Multiple Regression Model including all variables (n = 275)

Variable	B	95% CI	*ß*	*T*	*p**
Perceived Vulnerability	.06	.02; .09	.09	2.94	.00
Perceived Severity	.04	-.01; .08	.06	1.70	.09
Fear	.02	-.02; .07	.04	1.16	.25
Self-efficacy	.05	-.00; .11	.07	1.86	.06
Response efficacy	-.00	-.06; .05	-.00	-.07	.94
Response costs	-.03	-.10; .05	-.03	-.69	.49
Past protective behavior	.85	.77; .92	.79	23.04	.00

Note. Outcome variable: *Intention,* CI = Confidence Interval, *significant at *p* = .05.

Table 4

Multiple Regression Model including Threat Appraisal variables (n = 275)

Variable	B	95% CI	*β*	*T*	*p**
Past Protective Behavior	.43	.36; .47	.81	23.80	.00
Perceived Severity	.05	.01; .08	.09	2.61	.01
Perceived Vulnerability	.06	.02; .09	.11	3.28	.00
Perceived Severity x Past Protective Behavior	-.02	-.05; .01	-.05	-1.21	.23
Perceived Vulnerability x Past Protective Behavior	.01	-.02; .04	.03	.86	.37

Note. Outcome variable: *Intention,* CI = Confidence Interval, *significant at $p = .05$.

Table 5

Multiple Regression Model including Coping Appraisal variables (n=275)

Variable	B	95% CI	*β*	*T*	*p**
Past Protective Behavior	.43	.39; .47	.81	21.80	.00
Response efficacy	.00	-.04; .04	-.01	-.14	.89
Self-efficacy	.04	.01; .08	.07	1.79	.08
Response costs	-.03	-.07; .02	-.05	-1.02	.31
Response efficacy x Past Protective Behavior	-.01	-.05; .03	-.03	-.41	.68
Self-efficacy x Past Protective Behavior	.04	.00; .08	.08	2.04	.04
Response costs x Past Protective Behavior	.01	-.04; .05	.02	.24	.81

Note. Outcome variable: *Intention,* CI = Confidence Interval, *significant at $p = .05$.

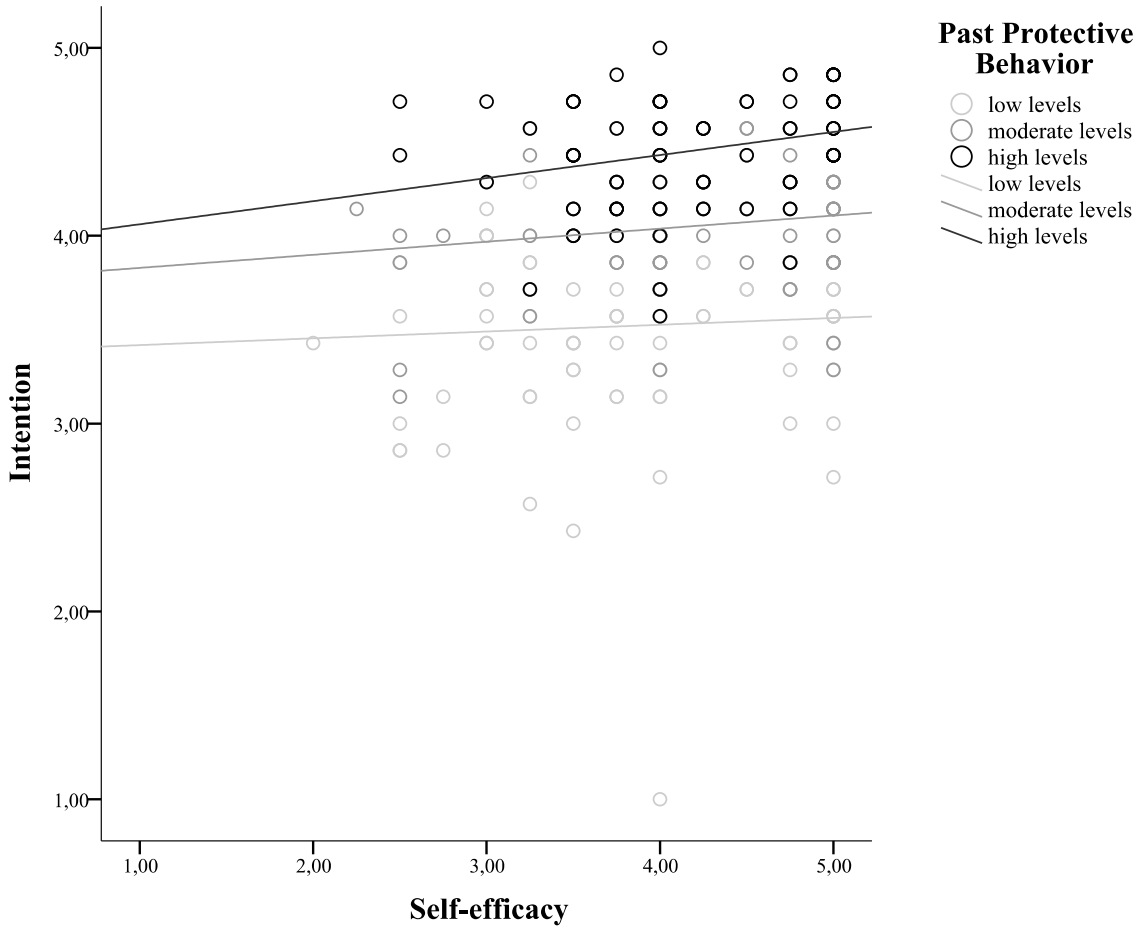

Figure 2. Visualization of the Interaction Effect of *Past Protective Behavior* and *Self-efficacy* on *Intention*

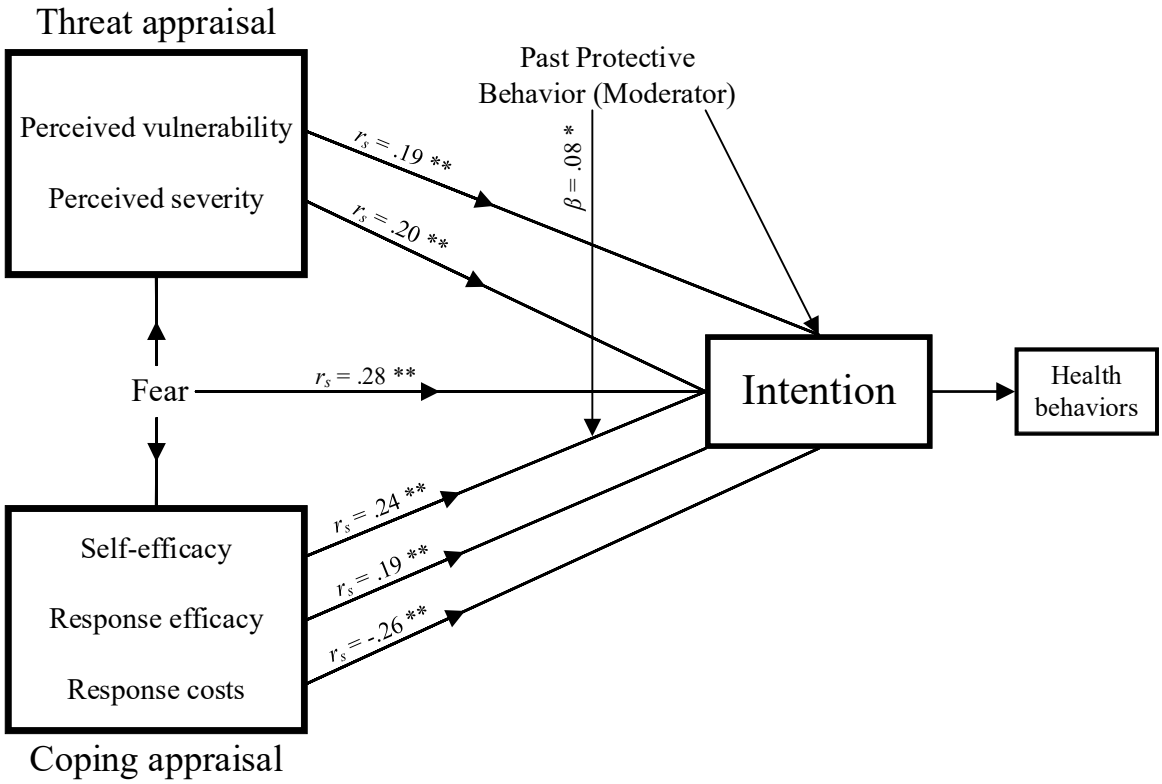

Figure 3. Results of testing the hypothesized relationships between all variables: Spearman's correlation coefficients (r_s) and standardized regression coefficients (ß). ** $p \leq .01$, *$p \leq .05$

Discussion

Summary of the Results

The study investigated the relationships between fear, cognitive appraisals and people's intention to engage in protective behavior during the current COVID-19 pandemic. Further, the main effects of people's past protective behavior and cognitive appraisals, as well as the potential moderation effect of past protective behavior on cognitive appraisals and protective behavior, were examined. The study was a correlational study based on a survey research design, and it was conducted in Germany.

The results suggested that all threat and coping variables, that is perceived vulnerability, perceived severity, self-efficacy, response efficacy and response costs, as well as fear, are weakly related to people's intention to engage in protective behaviors during the current COVID-19 pandemic. All correlations were in the expected direction, suggesting that high levels of perceived vulnerability, perceived severity, self-efficacy, response efficacy and fear were associated with increased protection motivation, while high response costs were associated with low levels of protection motivation. Therefore, H1-H6 were supported. When assessing the effect of each variable on intention in one model, only past protective behavior and perceived vulnerability were predictive for intention, suggesting that in direct comparison

to the other variables, perceived vulnerability had a weak effect, and past protective had a strong effect on intention. When both threat appraisal and coping appraisal variables were assessed separately, both threat appraisals and coping appraisal components were partly predictive for intention. That is, threat appraisal, including perceived severity and perceived vulnerability, was predictive for people's intention to engage in protective behaviors, but the effect was stronger for perceived severity. From the coping appraisal variables, only response efficacy and response costs were predictive for people's protection motivation, with response costs being a slightly stronger predictor, but the effects were generally weak. The effects for the threat and coping appraisals were all weak, with perceived severity being the strongest predictor for protection motivation. The results of those analyses therefore suggest that the relationship between the PMT variables and protection motivation during the COVID-19 pandemic is not as straightforward as expected. Generally, people's protective behavior earlier during the pandemic was more predictive for their intention to use protective behaviors in the future than threat or coping appraisals, and it was also the only construct to strongly predict protection motivation. Notably, considering past protective behavior also led to a strong increase of explained variance for both threat and coping appraisal models.

The study did not find evidence for an interaction effect between threat appraisal, past protective behavior and people's intention to engage in future protective behavior. Therefore, the relationship between people's threat appraisals and their intention to engage in protective behaviors during the COVID-19 pandemic was not moderated by their past protective behavior, and hence, H7a and H7b were rejected. No interaction effect was found for past protective behavior and response efficacy (H8b) and past protective behavior and response costs (H8c), on intention. Therefore, H8b and H8c were rejected. From the coping appraisal variables, an interaction effect was found only between past protective behavior and self-efficacy on intention (H8a). The interaction effect was in the expected direction but very weak. That is, for people who reported high levels of protective behavior in the past, the relationship between self-efficacy and future protection motivation was stronger, compared to people with moderate and low levels of protective behavior. Therefore, H8a was supported. It should be noted, however, that self-efficacy on its own was not predictive for intention. The strong main effect for past protective behavior on protection motivation and the presence of an interaction effect between past protective behavior and self-efficacy on people's intention to engage in protective behavior highlight the importance of people's past behavior, that is, their behavior earlier during the COVID-19 pandemic.

Theoretical Implications

In line with the findings of the current study, past research found main effects for both threat and coping appraisal components in people's intention to engage in protective behaviors during pandemics (Al-Rasheed, 2020; Barati et al., 2020, Dai et al., 2020; Floyd et al., 2000; Kaspar, 2020; Prentice-Dunn & Rogers, 1986; Sheeran & Orbell, 2000). However, a direct association between threat appraisal variables and intention was not consistently found in the literature (Brewer et al., 2007; Kok et al., 2010; Sharifirad et al., 2014; Teasdale et al., 2012; Walrave et al., 2020). In line with the results of the current study, most research involving threat appraisal variables point towards a weak effect, if any (Brewer et al., 2007).

Generally, the findings in the literature are inconsistent when it comes to the impact of threat appraisal on people's intention to engage in protective behavior. For instance, some research in the current COVID-19 pandemic (Jose et al., 2020; Kaspar, 2020; Shahnazi et al., 2020) found only perceived severity to affect the intention to engage in protective behavior during pandemics. Other research found both perceived severity and perceived vulnerability to be predictive for intention to engage in health-related behaviors (Al-Rasheed, 2020; Bish & Michie, 2010; Bish, Yardley, Nicoll, & Michie, 2011; Brewer et al., 2007; Floyd et al., 2000; Janz & Becker, 1984; Maddux & Rogers, 1983). Some studies found that perceived severity does not predict protective health behaviors (Coe et al., 2012; Lau et al., 2010; Sharifirad et al., 2014).

Such inconsistent results with regard to threat appraisal variables could be due to different reasons. One reason could be the assessment of different time points and sequence of events. For instance, research suggests that once people start engaging in protective behaviors, risk perceptions may decrease (Kaspar, 2020; Weinstein & Nicholich, 1993), suggesting the importance of considering the sequence of risk perceptions and use of behaviors during the course of the pandemic. Inconsistent results could also be due to poor variability in the data related to threat appraisal (Janz & Becker, 1984), or a potential influence of individual vulnerabilities on threat appraisal, such as anxiety disorders, which were associated with higher threat perceptions in the current COVID-19 pandemic (Mertens, Gerritsen, Duijndam, Salemink, & Engelhard, 2020). In fact, *intolerance of uncertainty* is a characteristic which is linked to anxiety-related disorders and can therefore be viewed as a vulnerability factor for clinical psychopathology (Carleton, 2016). *Intolerance of uncertainty* is a behavioral disposition defined by excessive planning and preparation for threats by seeking out information, with the ultimate goal to eliminate uncertainty, especially if the threat is high (Brouwers & Sorrentino, 1993). *Intolerance of uncertainty* requires a lot of time

and energy from the affected individual, and it was found to lead to increased levels of threat appraisal during the COVID-19 pandemic (Mertens et al., 2020). Differences in risk perceptions across the literature on virus diseases may also be due to differences in the nature of the diseases assessed (Montgomery et al., 1989). For instance, as COVID-19 is generally a more severe illness than an influenza virus, it is very likely that people have a higher risk perception for COVID-19 compared to influenza (CDC, 2020).

Past research found that coping appraisals are more predictive of protective health behaviors than threat appraisals in health-related behaviors, including pandemics (Floyd et al., 2000; Janz & Becker, 1984; Kok et al., 2010; Milne et al., 2000; Prentice-Dunn & Rogers, 1986; Teasdale et al., 2012; Timpka et al., 2014; Walrave et al., 2020). This is in line with the results of the current study, which found that the coping appraisal variables explain slightly more variance in intention to engage in protective behaviors than threat appraisal variables. The difference was, however, small.

Previous research suggested that response efficacy, self-efficacy and response costs are important predictors for people's intention to engage in protective behaviors (Brewer et al., 2007; Janz & Becker, 1984; Rogers, 1975; Rosenstock, 1974). Fear was also found to be related to the use of protective behaviors in earlier studies (Bubeck et al., 2012; Milne, 2002), however, in the current study, although a weak correlation was found between fear and intention to engage in protective behaviors, no main effect for fear could be detected.

Some researchers suggest that response efficacy and self-efficacy have an equally strong effect on future protective behaviors, which have however, either a weak or medium effect size (Al-Rasheed, 2020; Jiang et al., 2009; Kaspar, 2020; Lau, Kim, Tsui, & Griffiths, 2007; Maddux & Rogers, 1983; Rogers, 1975; Rubin, Amlôt, Page, & Wessely, 2009; Sharifirad et al., 2014; Teasdale et al., 2012; Williams et al., 2015). Some suggest self-efficacy to have the strongest effect (Barati et al., 2020; Maddux & Rogers, 1983; Milne et al., 2000; Schwarzer & Fuchs, 1996; Teasdale et al., 2012). Other researchers found response costs to have the strongest effect on people's intention to engage in protective behaviors, but the effect sizes range from weak to moderate (Janz & Becker, 1984; Coe et al., 2012; Milne et al., 2000; Teasdale et al., 2012). A meta-analysis by Janz and Becker (1984) found the effect of response costs to be the strongest, followed by response efficacy, which is similar to the findings of the current study. Research conducted during the current COVID-19 pandemic, however, suggested that response costs have the weakest effect on the intention to engage in protective behaviors (Barati et al., 2020; Teasdale et al., 2012), and another study did not find an effect for response costs at all (Kaspar, 2020). This is in contrast to the current study,

which found the effect for response costs on intention to engage in protective behavior to be the strongest out of all coping appraisal variables, and the effect for self-efficacy to be the weakest. Therefore, the current findings are not very much in line with other findings related to the COVID-19 pandemic (e.g. Barati et al., 2020; Kaspar, 2020), and evidence remains mixed.

The finding that past behavior strongly predicts people's intention to engage in protective behavior in the future was supported in previous studies (Bish et al., 2011; Coe et al., 2012; Hagger et al., 2018; Seale et al., 2010), and one study by Hagger et al. (2020) found evidence for this also during the COVID-19 pandemic. Similar to findings from earlier research (Hagger et al., 2018), the findings suggested that including past protective behavior led to a reduction of the effects of some social cognitive variables, that is the threat appraisal variables, on intention. In the current study, the effects of the coping appraisal variables even became non-significant after past protective behavior was added.

The additional variance introduced by adding past protective behavior may be due to the influence of habits or other implicit constructs (Ouellette & Wood, 1998; Wood, 2017; Hagger et al., 2020) that were not considered in the study. In fact, earlier studies found that such attenuated effects of social cognitive variables on intention, after past behavior was introduced, could indicate a habitual decision-making process, which needs to be investigated further (Wood, 2017). Earlier studies also suggested that past protective behavior may be explained by social cognitive variables (Hagger et al., 2016; Hagger et al., 2018). Although similarly to previous studies (Hagger et al., 2018; Hagger et al., 2020), a strong relationship was found between past behavior and intentions to engage in future behavior, the knowledge of what specifically this means for past protective behavior remains limited. The fact that the study did not find a moderation effect between past protective behavior and each PMT variable, except for self-efficacy, cannot be fully explained. It could, however, be that this could be due to other factors that happened in the past, which were not accounted for in the study.

As earlier studies found that risk perceptions are likely to decrease over the course of a pandemic (Gidengil, Parker, & Zikmund-Fisher, 2012; Kaspar, 2020), it could be that some people who engaged in protective behavior in the past had high risk perceptions at the beginning of the pandemic and engaged in protective behaviors, but they could have decreased over time, at the point when the study was conducted. The same explanation could apply to response efficacy and response costs. As self-efficacy was only significant in combination with past protective behavior, it could be that the significant interaction effect

between both variables could be due to the strong effect of past protective behavior on future intentions rather than variance accounted for by self-efficacy.

Practical Implications

The current study highlights the importance of emphasizing efficacy beliefs, risk severity and vulnerability in crisis communication, despite the effects being relatively weak. Even more important is encouraging people to maintain their protective behavior over the course of the pandemic. To implement these findings into practice, a positive, cooperative relationship between governmental institutions and the public is important (Li, Wang & Wang, 2018). To increase efficacy beliefs during a pandemic, authorities should communicate confidence in the public's capacity to adequately handle the pandemic from early on, especially as long as no vaccine is available (Bauch & Galvani, 2013; Tabernero, Castillo-Mayén, Luque, & Cardrado, 2020). Using language emphasizing the collective ('we'), rather than the individual ('I') is important to stimulate a sense of belonging to the community and hence increase collective and self-efficacy beliefs (Gersons, Smid, Smit, Kazlauskas, & McFarlane, 2020; The British Psychological Society, 2020). Such messages should be provided regularly, to prevent the decline of risk perceptions, and maintain adequate protection motivation over time (Bults et al., 2011). Authorities should encourage the use of actions that are easy to perform, and can be incorporated in people's routine, such as advising people to check whether they have disinfectants on them while they check for their house keys (Michie, West, Amlôt, & Rubin, 2020). In order to help people sustain their protective behavior over time, authorities should remind and urge the public to engage in protective behaviors over time and across settings, for instance by introducing rules, such as social distancing, wearing face masks and using disinfectants in public spaces and stores throughout the pandemic. Communicating a sense of positivity may instill confidence in people, leading to an increased sense of efficacy. People who are not capable to perform protective actions, such as people with special needs, should be provided with social support services that are executed by trained community support volunteers. As people from a lower socioeconomic background, unemployed or self-employed people may perceive higher response costs and are therefore less likely to engage in protective behaviors during a pandemic, they should be provided with financial means, and basic necessities such as food and medication, to decrease response costs and increase their efficacy beliefs (Adlhoch et al., 2020; Dai et al., 2020). Employment rights may also be changed temporarily, to ensure that people are confident to be able to protect themselves without facing financial or career-related disadvantages (Lunn et al., 2020).

To increase risk perceptions and risk understanding, people should be provided with information about the risk, which ultimately increases their likelihood to engage in protective behaviors (Lindell & Perry, 2003). This includes knowledge about the virus and its transmission and information about effective protective behaviors. In addition, it should be clarified what specific behaviors people should adopt during the pandemic and why (Michie & Johnston, 2004). However, providing people with too much information about the virus could lead to a decline in self-efficacy and an increase in perceived response costs (Farooq, Laato, & Islam, 2020), and frequently reporting new infected cases may instill a sense of panic in the public (Li, Wang, & Wang, 2018). Evoking anxiety should be avoided, as it could lead to counterproductive behaviors of defensive avoidance (Michie et al., 2020). Instead, anxiety-provoking messages should be coupled with protective behaviors that people can Implement (Peters, Ruiter, & Kok, 2013). If people, however, experience high levels of anxiety or increased social deprivation and depression during the pandemic, social support services should be provided (Bults et al., 2011).

Limitations

One limitation of the current study is that the data used did not fully meet the psychometric requirements for an accurate statistical analysis, because the data were non-linear and slightly skewed. Moreover, the current study was a correlational study, based on convenience sampling, with respondents from a high-educational background, including predominantly students. As risk perceptions substantially vary across demographic factors (Costa, 2020; Jose et al., 2020), and the current study seemed to be highly homogenous in terms of demographic factors, the ability to make generalizations to the German population is limited. The fact that most participants in the current study have not been in contact with COVID-19, either directly or indirectly through acquaintances, at the time when the data collection took place also limits generalizability. The use of self-reports could have additionally led to social desirability bias, particularly in the field of risk perception (Brewer et al., 2007).

Data collection took place over a time span of one month from July to August 2020, approximately four to five months after the COVID-19 pandemic has been declared as such (WHO, 2020a). During such uncertain times, mental health fluctuations are very likely, and confounding variables, such as updates frequently provided through media and people's knowledge about the disease spread, may have potentially influenced people's risk perceptions and coping appraisals (Jose et al, 2020; Kwok et al., 2020). The participants were assessed between the first and second wave of the COVID-19 pandemic (Worldometer,

2020). Past research found, however, that surviving the first wave could provide people with a false sense of immunity, suggesting that risk perceptions and self-efficacy beliefs may decrease over the course of the pandemic (Gidengil et al., 2012; Goodwin, Gaines, Myers, & Neto, 2011; Kaspar, 2020). This could occur once people get in contact with the virus at hand and realize its mild nature (Ofri, 2009). The findings related to the moderation of past protective behavior also bear some limitations, as past protective behavior was measured retrospectively, coping and threat appraisal were measured based on present assessments, and protection motivation was measured based on prospective measures, which could have been influenced by external factors that were not considered.

Another limitation of the current study is that intention, rather than objective behavior, was assessed, which limits the accuracy of the findings. Past research suggested that people's intentions are strongly associated with their concurrent behavior, but this was only true for perceived vulnerability, self-efficacy and response costs (Rimer, Glanz, & Rasband, 2001).

Strengths

The current study adds valuable insights into the PMT literature, by confirming the importance of threat and coping appraisals to predict people's intention to engage in protective measures during the COVID-19 pandemic. Moreover, the study is, to my knowledge, the only one investigating the moderating role of past protective behavior on the relationship between threat and coping appraisal and protective behavior. The fact that the study was conducted during the COVID-19 pandemic, rather than creating a hypothetical scenario of a pandemic, as it is commonly done in crisis research (e.g. Williams et al., 2015), is beneficial as collecting data at such unique times of crises can gather accurate and important knowledge which is required to adequately deal with future crises. The current study also provides a baseline that allows for comparison with COVID-19 studies from other countries. The PMT items that were constructed in the current study showed good reliability, which indicates that they could be adopted in future studies where similar pandemic contexts are investigated.

Future Considerations

Due to the fact that a lot of factors seem to influence the adoption of protective behavior during pandemics (Lin et al., 2018), future research could integrate the findings of the current study with other factors that could influence both people's fear and threat and coping appraisals, such as the role of trust in the federal government, crisis communication, people's knowledge about protective measures and the spread of the virus, influences of social media and people's social context, among others (Jose et al., 2020; Khosravi, 2020;

Rosenstock, 1974). Longitudinal studies measuring objective behavior could provide insight into how threat and coping appraisals and protective behavior may change over the course of the pandemic which could in turn guide authorities and researchers to develop appropriate measures to directly target people's appraisal processes. To investigate the role of past protective behavior more, implicit constructs should be added, such as habits, which could help explain the underlying mechanisms of the use of protective measures (Hagger et al., 2020).

Future research should also compare people's risk perceptions and coping appraisals across countries, with different health care systems. As the German government's response and leadership during the early stage of the COVID-19 pandemic was generally viewed as positive, with relatively low fatality rates, a high number of tests performed and a high availability of intensive care beds with respiratory support (Bauer et al., 2020; Wieler, Rexroth & Gottschalk, 2020), it would be interesting to compare the findings of the current study to findings from other countries. For instance, it would be interesting to investigate whether people from countries which experienced a collapse of the healthcare system during the pandemic, or those that perceive national leadership during the COVID-19 pandemic as poor, such as the United States (Pew Research Center, 2020), show higher threat appraisals and lower efficacy beliefs. By taking into account different contexts of people, potential sources of efficacy beliefs and risk perceptions could be located, and different prevention efforts can be made.

Conclusion

The present study provides valuable insights into people's cognitions and their motivation to engage in protective behaviors during the current COVID-19 pandemic. The study highlights the importance of both threat and coping appraisals in predicting people's protection motivation and takes into account the role of past protective behavior, which was found to have the strongest influence on protective behavior in the current study. However, the ability of protective behavior to explain the relationship between coping and threat appraisal and protection motivation remains limited. Future research could use longitudinal research designs to investigate how people's risk perceptions and coping appraisals interact with other factors, such as media or trust in the government, and how this influences behavior maintenance over the course of a pandemic.

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Appendix A

Pearson's Correlations

Table A1

Summary Statistics and Pearson's Correlation of the PMT variables, Fear, Past Protective Behavior and Intention (n=275)

Variable	*M*	*SD*	1	2	3	4	5	6	7	8
1. Perceived Vulnerability	2.84	.90	1.00							
2. Perceived Severity	2.60	.84	.14**	1.00						
3. Self-efficacy	4.08	.72	.07	.01	1.00					
4. Response efficacy	4.17	.73	.00	.14*	.31**	1.00				
5. Response costs	1.75	.66	-.06	-.15**	-.60**	-.53**	1.00			
6. Fear	2.76	.94	.17**	.46**	-.01	.26**	-.09	1.00		
7. Past Protective Behavior	4.13	.50	.09	.19**	.19**	.29**	-.33**	.25**	1.00	
8. Intention	4.01	.53	.19**	.25**	.25**	.29**	-.35**	.29**	.84**	1.00

Note. *Correlation is significant at .05 level (1-tailed).
**Correlation is significant at .01 level (1-tailed).

Table A2

Differences between Spearman's and Pearson's correlation coefficients

Variable	1	2	3	4	5	6	7	8
1. Perceived Vulnerability	0							
2. Perceived Severity	-.03	0						
3. Self-efficacy	.00	-.14	0					
4. Response efficacy	-.07	-.08	-.03	0				
5. Response costs	.03	.03	-.01	.06	0			
6. Fear	.01	-.02	.01	-.03	.01	0		
7. Past Protective Behavior	-.01	-.07	-.03	-.10	.11	-.02	0	
8. Intention	.01	-.05	-.01	-.09	.09	-.01	-.04	0

Appendix B

Informed Consent

Einwilligungserklärung

Willkommen zu dieser Studie. Bitte lesen Sie die Informationen auf dieser Seite sorgfältig durch. Sie sind eingeladen, an einer Forschungsstudie der Universität Twente teilzunehmen. Mithilfe der Studie möchte ich den Zusammenhang zwischen Motivation und dem Einhalten von Schutzmaßnahmen während der aktuellen COVID19-/Corona-Pandemie erforschen. Dabei interessiere ich mich einerseits für die Einhaltung der Schutzmaßnahmen zu Beginn der Corona-Pandemie, aber auch für die Motivation der Menschen, in Zukunft die Schutzmaßnahmen umzusetzen.

Die Daten werden vollständig anonym und vertraulich behandelt.

Dauer. Die Studie dauert 5-10 Minuten.

Risiken. Es gibt keine oder nur minimale vorhersehbare physische oder emotionale Risiken.

Vertraulichkeit. Um die Vertraulichkeit zu gewährleisten, sind Ihre Antworten anonym (Persönliche Identifizierungsinformationen können nicht mit Ihren Antworten abgeglichen werden) und es werden nur Gruppendurchschnitte analysiert (Einzelne Leistungen werden nicht analysiert).

Rechte. Ihre Teilnahme an der Studie ist freiwillig. Sie haben das Recht, jederzeit während der Studie ohne Angabe von Gründen und ohne Konsequenzen, die Studie abzubrechen. Sie haben auch das Recht, die Beantwortung bestimmter Fragen zu verweigern. Ihre Privatsphäre wird in allen veröffentlichten und schriftlichen Daten, die aus dieser Studie resultieren, gewahrt. Für weitere Informationen oder Fragen zu dieser Studie wenden Sie sich bitte an Rieke Schmees (r.l.schmees@student.utwente.nl) oder Dr. Margôt Kuttschreuter (m.w.m.kuttschreuter@utwente.nl). Haben Sie die oben aufgeführten Informationen gelesen und stimmen der Teilnahme an der Studie zu?

Appendix C

Descriptions of the items (English)

Table C1
Sociodemographic items

Construct	Item	Response options
Gender	What is your gender?	male; female; other
Age	How old are you in years?	…
Nationality	What is your nationality?	German; Other…
Country of Residence	In which country are you currently living?	Germany; Other ...
Number of inhabitants	How many inhabitants live in the city or town in which you live?	< 5,000 inhabitants; 5,001 – 20,000 inhabitants; 20,001 – 100,000 inhabitants; 100,000 – 500,000 inhabitants; > 500,000 inhabitants; I don't know.
Marital status	What is your marital status?	Single, never married; Married or domestic partnership; Widowed; Divorced; Separated
Household size	How many people live in your household?	…
Educational level	What is the highest level of school you have completed or the highest degree you have received?	Less than high school degree; High school degree or Equivalent; Bachelor's degree; Master's degree; Doctorate; Other
Occupation status	Which of the following categories best describes your employment status?	Employed full-time; Employed part-time; Unemployed; Retired; Student; Disabled; Self-employed; Other.

Table C2
Overview of the items related to Past Protective Behavior

Item		Response frame
Which measures have you taken in the **last month** to protect yourself or your family from the novel coronavirus?	Avoiding the public	Always – Never
	Washing hands	Always – Never
	Keeping distance to others	Always – Never
	Using disinfectants	Always – Never
	Complying with government regulations	Always – Never
	Paying more attention to hygiene in general	Always – Never
	Wearing protective clothing	Always – Never

Table C3
Overview of the items related to Protection Motivation/Intention

Item		Response frame
Which measures do you intend to take **in the next month t**o protect yourself or your family from the novel coronavirus?	1. Avoiding the public	Always – Never
	2. Washing hands	Always – Never
	3. Keeping distance to others	Always – Never
	4. Using disinfectants	Always – Never
	5. Complying with government regulations	Always – Never
	6. Paying more attention to hygiene in general	Always – Never
	7. Wearing protective clothing	Always – Never

Table C4
Overview of the items related to Threat/Coping Appraisals and Fear

Dimension	Item	Response frame
Perceived severity	1. If I were to become infected with the novel coronavirus, I would suffer a lot of pain.	Strongly disagree – Strongly agree
	2. Becoming infected with the novel coronavirus would be likely to cause me to become severely ill.	Strongly disagree – Strongly agree
Perceived vulnerability	3. My chances of becoming infected with the novel coronavirus in the future are high.	Strongly disagree – Strongly agree
	4. I am likely to become infected with the novel coronavirus in the future.	Strongly disagree – Strongly agree
Fear	5. The thought of becoming infected with the novel coronavirus makes me feel frightened.	Strongly disagree – Strongly agree
	6. The thought of becoming infected with the novel coronavirus makes me feel anxious.	Strongly disagree – Strongly agree
	7. The thought of becoming infected with the novel coronavirus makes me feel worried.	Strongly disagree – Strongly agree
	8. The thought of becoming infected with the novel coronavirus makes me feel scared.	Strongly disagree – Strongly agree
Response efficacy	9. Because of the wide range of positive effects engaging in protective measures has for myself, it is a good way of reducing the risk of becoming infected with the novel coronavirus.	Strongly disagree – Strongly agree
	10. Engaging in protective measures decreases my chances of becoming infected with the novel coronavirus.	Strongly disagree – Strongly agree
Self-efficacy	11. I am discouraged from engaging in the protective measures during **the next month** because I feel overwhelmed to do so. (REVERSED ITEM)	Strongly disagree – Strongly agree
	12. I feel confident in my ability to engage in protective measures **during the next month.**	Strongly disagree – Strongly agree
	13. It would not be difficult for me to engage in protective measures **during the next month.**	Strongly disagree – Strongly agree

	14. Engaging in protective measures during the **next month** is easy for me.	Strongly disagree – Strongly agree
Response costs	15. The benefits of engaging in protective measures during the novel coronavirus pandemic outweigh the costs. (REVERSED ITEM)	Strongly disagree – Strongly agree
	16. Engaging in protective measures during the **next month** would cause me too many problems.	Strongly disagree – Strongly agree
	17. I would be discouraged from engaging in protective measures during the **next month** as it would take too much time.	Strongly disagree – Strongly agree
	18. I would be discouraged from engaging in protective measures during the **next month** because I would feel silly doing so.	Strongly disagree – Strongly agree

Table C5

Overview of the items related to Risk factors

Construct	Item	Response options
Illness status	Do you have a chronic illness?	Yes; No; I don't know.
Risk group	Are you, or have you been infected with the novel coronavirus?	Yes; No; I don't know.
	Have you been tested on the novel coronavirus?	Yes, tested and the result was positive; Yes, tested and the result was negative; No, not tested but I suspect to be infected; No, not tested and I did not suspect to be infected.
	Do you know people in your immediate environment who are or have been infected with the novel coronavirus?	Yes; No; I don't know.
	Do you know people in your immediate environment who have been tested on the novel coronavirus?	Yes, tested and the result was positive; Yes, tested and the result was negative; No, not tested but he or she suspected to be infected; No, not tested and he or she did not suspect to be infected; I don't know.
	If you know someone who has been tested on the novel coronavirus, how did you feel about that?	…

Appendix D

Description of the items (German)

Table D1
Sociodemographic items

Construct	Item	Response frame
Geschlecht	Welches Geschlecht haben Sie?	weiblich; männlich; divers; keine Angabe
Alter	Wie alt sind Sie in Jahren?	…
Nationalität	Was ist Ihre Nationalität?	Deutsch; Andere Nationalität: …
Wohnsitz	In welchem Land leben Sie derzeit?	Deutschland; Anderes Land: ...
Familienstatus	Sind Sie derzeit verheiratet, verwitwet, geschieden, getrennt oder ledig?	Ledig; Verheiratet oder feste Beziehung; Verwitwet; Getrennt; Geschieden
Bildungsabschluss	Welchen Bildungsabschluss haben Sie? Bitte wählen Sie den höchsten Bildungsabschluss, den Sie bisher erreicht haben.	Kein Schulabschluss; Grund-/Hauptschulabschluss; Realschule (Mittlere Reife); Gymnasium (Abitur); Abgeschlossene Ausbildung; Fachhochschulabschluss; Hochschule (Diplom); Hochschule (Bachelor); Hochschule (Master/Magister); Hochschule (Promotion), Anderer ...
Beschäftigungsstatus	Welche der folgenden Kategorien beschreibt Ihren Beschäftigungsstatus am besten?	Angestellt (Vollzeit); Angestellt (Teilzeit/Aushilfe); Ohne Beschäftigung; Pensioniert; Student; Behindert/Arbeitsunfähig; Selbstständig; Sonstiges.

Table D2
Overview of the items related to Past Protective Behavior

Item		Response frame
Welche Maßnahmen haben Sie im **letzten Monat** ergriffen, um sich oder Ihre Familie vor dem neuartigen Coronavirus zu schützen?	1. Die Öffentlichkeit meiden	Immer – Nie
	2. Händewaschen	Immer – Nie
	3. Abstand zu anderen halten	Immer – Nie
	4. Desinfektionsmittel benutzen	Immer – Nie
	5. Einhaltung der behördlichen Vorschriften	Immer – Nie
	6. Mehr auf Hygiene im Allgemeinen achten	Immer – Nie
	7. Schutzkleidung tragen	Immer – Nie

Table D3
Overview of the items related to Protection Motivation/Intention

Item		Response frame
Welche Maßnahmen beabsichtigen Sie im nächsten Monat zu ergreifen, um sich oder Ihre Familie vor dem neuartigen Coronavirus zu schützen?	1. Die Öffentlichkeit meiden	Immer – Nie
	2. Händewaschen	Immer – Nie
	3. Abstand zu anderen halten	Immer – Nie
	4. Desinfektionsmittel benutzen	Immer – Nie
	5. Einhaltung der behördlichen Vorschriften	Immer – Nie
	6. Mehr auf Hygiene im Allgemeinen achten	Immer – Nie
	7. Schutzkleidung tragen	Immer – Nie

Table D4
Overview of the items related to Threat/Coping Appraisals and Fear

Dimension	Item	Response frame
Perceived severity	1. Wenn ich mich mit dem neuartigen Coronavirus infizieren würde, würde ich große Schmerzen haben.	Stimme überhaupt nicht zu - Stimme voll zu
	2. Wenn ich mit dem neuartigen Coronavirus infiziert werde, würde ich wahrscheinlich schwer krank werden.	Stimme überhaupt nicht zu – Stimme voll zu
Perceived vulnerability	3. Das Risiko, dass ich in Zukunft mit dem neuartigen Coronavirus infiziert werde, ist hoch.	Stimme überhaupt nicht zu – Stimme voll zu
	4. Es ist wahrscheinlich, dass ich in Zukunft mit dem neuartigen Coronavirus infiziert werde.	Stimme überhaupt nicht zu – Stimme voll zu
Fear	5. Der Gedanke, mit dem neuartigen Coronavirus infiziert werden zu können, verängstigt mich.	Stimme überhaupt nicht zu – Stimme voll zu
	6. Der Gedanke, mit dem neuartigen Coronavirus infiziert werden zu können, beunruhigt mich.	Stimme überhaupt nicht zu – Stimme voll zu
	7. Der Gedanke, mit dem neuartigen Coronavirus infiziert werden zu können, besorgt mich.	Stimme überhaupt nicht zu – Stimme voll zu
	8. Der Gedanke, mit dem neuartigen Coronavirus infiziert werden zu können, schüchtert mich ein.	Stimme überhaupt nicht zu – Stimme voll zu
Response efficacy	9. Da ich die Schutzmaßnahmen als sinnvoll erachte, sind sie für mich eine gute Möglichkeit, das Risiko einer Infektion mit dem neuartigen Coronavirus zu verringern.	Stimme überhaupt nicht zu – Stimme voll zu.

	10. Wenn ich Schutzmaßnahmen ergreife, verringern sich meine Chancen, mit dem neuartigen Coronavirus infiziert zu werden.	Stimme überhaupt nicht zu – Stimme voll zu.
Self-efficacy	11. Ich fühle mich überfordert, im **nächsten Monat** Schutzmaßnahmen zu ergreifen. (REVERSED ITEM)	Stimme überhaupt nicht zu – Stimme voll zu.
	12. Ich bin zuversichtlich, dass ich im **nächsten Monat** Schutzmaßnahmen ergreifen kann.	Stimme überhaupt nicht zu – Stimme voll zu.
	13. Es würde mir nicht schwer fallen, im **nächsten Monat** Schutzmaßnahmen zu ergreifen.	Stimme überhaupt nicht zu – Stimme voll zu.
	14. Im **nächsten Monat** Schutzmaßnahmen zu ergreifen, wäre für mich einfach.	Stimme überhaupt nicht zu – Stimme voll zu.
Response costs	15. Wenn ich die Vor- und Nachteile der genannten Schutzmaßnahmen abwäge, überwiegen die Vorteile. (REVERSED ITEM)	Stimme überhaupt nicht zu – Stimme voll zu.
	16. Im **nächsten Monat** Schutzmaßnahmen zu ergreifen, würde mir zu viele Probleme bereiten.	Stimme überhaupt nicht zu – Stimme voll zu.
	17. Im **nächsten Monat** Schutzmaßnahmen zu ergreifen würde mich zu viel Zeit kosten.	Stimme überhaupt nicht zu – Stimme voll zu.
	18. Wenn ich im **nächsten Monat** Schutzmaßnahmen ergreifen würde, würde ich mich albern fühlen.	Stimme überhaupt nicht zu – Stimme voll zu.

Table D5

Overview of the items related to Risk factors

Construct	Item	Response options
Illness status	Haben Sie eine chronische Krankheit?	Ja; Nein; Weiß ich nicht.
Risk group	Sind Sie, oder waren Sie in der Vergangenheit mit dem neuartigen Coronavirus infiziert?	Ja; Nein; Weiß ich nicht.
	Wurden Sie in der Vergangenheit auf das neuartige Coronavirus getestet?	Ja, getestet und das Ergebnis war positiv; Ja, getestet und das Ergebnis war negativ; Nein, nicht getestet aber ich vermute, infiziert zu sein; Nein, nicht getestet und ich vermute nicht, infiziert zu sein.
	Gibt es Menschen in Ihrem direkten Umfeld, die mit dem neuartigen Coronavirus infiziert sind, oder waren?	Ja; Nein; Weiß ich nicht.

Gibt es Menschen in Ihrem direkten Umfeld, die auf das neuartige Coronavirus getestet wurden?	Ja, getestet und das Ergebnis war positiv; Ja, getestet und das Ergebnis war negativ; Nein, nicht getestet aber er/sie vermutet infiziert zu sein; Nein, nicht getestet und er/sie vermutet nicht infiziert zu sein; Weiß ich nicht.
Falls Sie jemanden kennen, der positiv auf das Coronavirus getestet wurde, wie haben Sie sich diesbezüglich gefühlt?	…

Appendix E

Debriefing

Vielen Dank für Ihre Teilnahme an der Studie. Falls Sie noch Fragen oder Anmerkungen zu der Studie haben, wenden Sie sich bitte an Rieke Schmees (r.l.schmees@student.utwente.nl) oder Dr. Margôt Kuttschreuter (m.w.m.kuttschreuter@utwente.nl).

Sind Sie damit einverstanden, dass Ihre Daten für Forschungszwecke genutzt werden dürfen?