How Government Trust Influences Perception of Flood Hazard Risk: Experimental Evidences in China

Kai Li[1], Feng Yu[2], Shenlong Yang[2], and Yongyu Guo[2]

[1]Wuhan University
[2]Affiliation not available

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Abstract

Perception of flood hazard risk and people's trust in the government have vital influences on risk communication. We conducted three studies to examine the relation and mechanism of trust and flood hazard risk perception. In Study 1, we found that people's risk perception and government trust were significantly negatively correlated. In Studies 2 and 3, using correlational and experimental methods, we found that the higher the public's trust in the government, the more they used heuristics to process risk information, and their risk perception was lower than the group with low trust in the government. Our results suggest that government trust can influence risk perception via heuristics.

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ABSTRACT

Perception of flood hazard risk and people's trust in the government have vital influences on risk communication. We conducted three studies to examine the relation and mechanism of trust and flood hazard risk perception. In Study 1, we found that people's risk perception and government trust were significantly negatively correlated. In Studies 2 and 3, using correlational and experimental methods, we found that the higher the public's trust in the government, the more they used heuristics to process risk information, and their risk perception was lower than the group with low trust in the government. Our results suggest that government trust can influence risk perception via heuristics.

Keywords : government trust, information processing, perception of flood hazard risk

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INTRODUCTION

Floods are a very destructive natural disaster (Kellens, Terpstra, Schelfaut, & De Maeyer, 2013). Risk perception refers to people's subjective estimation of the likelihood and dread (Slovic, 1987). As people sometimes do not take suggestions made by the government because of their misperception of floods risk (Bradford et al., 2012), clarifying the complex relationship between government trust and risk perception is becoming increasingly vital to increase the efficiency of risk communication (O'Sullivan et al., 2012).

Trust—which stems from people's judgments concerning an authority's propensity to be open and honest—serves to reduce people's perception of the complexity and uncertainty of a situation (White & Johnson, 2010). Trust is a mechanism for the reduction of complexity, it enables people to maintain their capacity to act in a complex environment (Siegrist, 2021). Trust is essential for a better understanding of people's

risk perceptions. Trust allows people to adapt to various hazards they face in society and react in a rational way (Siegrist & Cvetkovich, 2000; Viklund, 2003; Welch et al., 2005). Terpstra (2011) noted that trust and affect share similarities—both constructs reduce the complexity of risk judgment and consequently serve as "quick" guides for assessing risks. In the past decades, the relationship between trust and risk perception has received great attention (e.g., Freudenburg, 1993; Nakayachi & Cvetkovich, 2010; Siegrist, Luchsinger, & Bearth, 2021). Frewer, Howard, Hedderley, & Shepherd, 1996; Shi, Visschers, & Siegrist, 2015).

Trust in government indicates people's satisfaction with specific public services, citizens' trust in government plays a pivotal role in improving government work and consolidating public legitimacy (Christensen & Laegreid, 2005). Trust in government has more significant effect on physical health and social relationship (Liang, 2016). government and social trust play indispensable roles in shaping risk perceptions, trust in central government leads to lower risks perceptions (Ma & Christensen, 2019). People with higher degrees of trust in government perceive lower consequences of potential earthquakes and tend to prepare less (Han et al., 2016).

However, the importance of trust has often been questioned (Siegrist, 2021; Sjöberg, 2001; Vainio et al., 2017; Viklund, 2003). Some researchers found that trust will decrease risk perception (Tumlison, Moyer, & Song, 2017; Vainio, Paloniemi, & Varho, 2017). While, some researchers argue that a weak correlation exists between trust and risk perception (Lin, Shaw, & Ho, 2008; Sjöberg, 2001). Moreover, previous research has not clarified the relationship between trust and risk perception that is whether trust causally influences risk perception is not clear (Siegrist, 2021). Eiser et al.(2002) insist that trust does not causally influence risk perception, and both variables are simultaneously influenced by people's attitudes. To examine the role of trust, we designed three studies to examine how people's trust in government influences how they process information and subsequently perceive risk.

THEORETICAL FRAMEWORK AND HYPOTHESES

2.1. Government Trust and Flood Risk Perception

Prior studies showed that trust has an important role in perceived risk and often leads to a lower level of risk perception. For example, Terpstra (2011) and Hung (2009) found that trust in public flood protection was negatively related to preparedness. Grothmann and Reusswig (2006) reported that relying on flood protection was negatively correlated with information seeking and with the adoption of flood-mitigation measures in the past.

In contrast, some researchers have questioned the relationship between trust and the perception of hazards (e.g., Eiser, Miles, & Frewer, 2002; Sjöberg, 2001; Viklund, 2003). For example, Sjöberg (2001) revealed a weak correlation between trust and risk perception. Lin et al. (2008) indicated that higher levels of trust or confidence in crisis management and provision of flood warnings (by government, risk experts, and the media) increased mitigation intentions, insurance purchase intentions, and information-seeking intentions. In China, weather changes and flood hazard information are released to the public by government-run media, information on whether flood risk occurs is also released by the government. Therefore, we focus on the government trust, which is the degree of the people think the government will protect them, including confidence and intentions.

2.2. Government Trust, Information processing, and Flood Risk Perception

Trust is one of the factors that affects information processing (Petty, Priester, & Brinol, 2002). Frewer et al. (1997) used experimental methods to test the relationship between the processing of food safety information and the confidence of information sources. They found that the credibility of information sources had a negligible effect on the internalization of information, while the content of the persuasive information or the type of disaster played a more prominent role (Frewer, Howard, Hedderley, & Shepherd, 1997). The researchers found that trust, as an information clue, had a significant effect on systemic information processing. Specifically, for high-confidence information, individuals rarely utilize detailed identification and processing—rather, they rely more on their previous attitudes. Contrastingly, for low-confidence information,

individuals think more about the issue (De Dreu & Beersma, 2010). Concurrently, the researchers found that heuristic information processing was negatively correlated with disease risk perception and nuclear risk perception, and systematic information processing was positively correlated with risk perception (Tortosa-Edo et al., 2014; Trumbo & McComas, 2003, 2008). Trumbo (2002) suggested that those who systematically process risk information might find that some problems are worth worrying about; thus, their risk perception will be high.

Nonetheless, the prior research has some limitations. First, the mechanism between trust and risk perception remains unclear: Do systematic or heuristic strategies mediate the relationship between trust and risk perception? Second, prior research was conducted with correlational studies; therefore, the causality issue remains to be solved.

To address these limitations, we conducted three studies. We hypothesized that a negative relationship exists between trust in government and risk perception (H1). Specifically, a positive relationship exists between trust and heuristics processing (H2), and a negative relationship exists between trust and systematic processing (H3). Finally, heuristics processing (H4) and systematic processing (H5) mediate the relationship between government trust and risk perception.

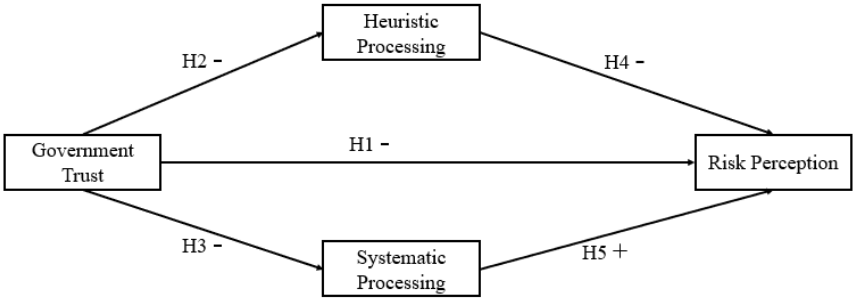

Figure 1 The mediating role of Heuristic Processing and Systematic Processing between Government Trust and Risk Perception

2.3. The Present Research

We designed three studies to examine the psychological mechanism through which government trust affects the public's perception of risk in the context of flood threats in China. Study 1 examines whether the relationship between trust and risk perception exists. Study 2 examines the mechanism of the effects of trust and risk perception. In Study 3, we designed an experiment to re-examine whether government trust has an impact on information processing methods and affects subsequent risk perception.

The present research expands on previous studies in three important ways. First, it examines the relationships of government trust and risk perception in China, broadening the scope of risk perception research beyond Western, educated, industrialized, rich, and democratic samples (Henrich, Heine, & Norenzayan, 2010). Second, the relationship between trust and risk perception is elucidated with flood risk as a backdrop, using correlational and experimental methods, which will ensure robust results. Third, we examined the mechanism of trust and risk perception.

STUDY 1

Study 1 was designed to examine whether government trust is negatively associated with the public's perception of flood risk. We collected data using the questionnaire method and observed the relationships between variables.

3.1. Method

3.1.1. Participants

To obtain small–medium power (effect size $f^2 = .05$ in a linear multiple regression analysis), a G*Power analysis suggested a total sample size of 159 participants was needed to obtain a power of .80 (Faul, Erdfelder, Buchner, & Lang, 2009). However, because we did not know the "true effect," we oversampled in Study 1. Therefore, we recruited 360 participants in Wuhan, China, in 2016. Wuhan is downstream of the Yangtze River; thus, it is often threatened by flood risk during the June-to-September monsoon season (Liu, Wang, & Li, 2014). Thirty invalid questionnaires were excluded for random responding (i.e., giving the same answer to all items or reporting an age > 100 years). Thus, the data from 330 participants were analyzed (222 women, 107 men, 1 did not report sex; $M_{age} = 23.26 \pm 6.25$ years).

3.1.2. Materials

Government Trust . We asked the participants how much they would trust the government in managing flood risks in Wuhan after having experienced the rainfall that caused waterlogging in 2016. Responses were made on a five-point Likert scale (1 = "completely distrust" to 5 = "completely trust").

Risk Perception of Flood. Seven items were adapted from Lin et al. (2008) and revised for the current context (e.g., "I feel worry/fear/panic recently"). Participants responded to each item on a scale ranging from 1 = "not at all" to 5 = "extremely." Cronbach's alpha in this study was 0.79.

3.1.3. Procedure

This study was approved by the Ethics Review Board of the XX University. We recruited participants by the Sojump, Sojump is an online participant recruitment platform in Mainland China. Participants gave their input on the government trust scale, completed the flood risk perception questionnaire, and provided demographics information (in that order). We used SPSS 23.0 software for statistical analyses.

3.2. Results

People's trust in the government can significantly predict their risk perception (b = -0.25, $p < .01$). These analyses indicated that government trust is negatively correlated with risk perception. This is consistent with previous results in the fields of food risk perception (e.g., Lu, Xie, & Xiong, 2015). While, the mechanism behind trust and risk perception still unclear. In study 2, we further tested the relationship between government trust and risk perception and the mechanism behind them.

STUDY 2

Study 2 explores the mechanism behind why trust and risk perception are negatively correlated. We hypothesized that information processing methods mediate the effect of government trust on risk perception (H2–H5).

4.1. Method

4.1.1. Participants

We used G*Power (Faul et al., 2009) to conduct a power analysis with alpha = .05, power = .95, and a small effect size, for a regression analysis of three predictors on a continuous outcome. Attaining a small effect ($f^2 = 0.02$) with those parameters required 863 participants. A total of 900 questionnaires were distributed. After excluding 37 invalid questionnaires (missing data), the sample included 863 individuals (447 women, 416 men;$M_{age} = 20.93 \pm 2.06$ years).

4.1.2. Procedure

This study was approved by the Ethics Review Board of the Central China Normal University. Paper questionnaires were distributed in the libraries and study rooms of universities in Wuhan. At the beginning of the questionnaire, all participants were fully informed that their anonymity was guaranteed, and they could choose to withdraw at any time. If they completed the study, a small gift (about 0.5 U.S. dollars at the time of the study) was provided. All participants also provided demographic information.

4.1.3. Materials

Government Trust Scale . This research refers to the measurement method of Ter Huurne and Gutteling (2009) on company trust, which was revised to "government trust" for this study. The questionnaire contains five statements, such as, "I believe the government will take measures as much as possible to minimize the flood threat faced by the people" (1 = completely unbelieve, 5 = completely believe). In this study, Cronbach's α was 0.87.

Information Processing Method Questionnaire. The questionnaire used by Trumbo and McComas (2003, 2008) was used. Systematic processing comprised four items; a sample item is "When I see information related to flood threats, such as weather and river water levels, I need to think carefully about its reliability and authenticity." Ratings were provided on a 7-point Likert scale from 1 (not at all) to 7 (extremely), with higher scores indicating more systematic processing. Cronbach's alpha was 0.65 in this study. Heuristic processing comprised four items; a sample item is "Past experience makes it easy for me to judge the severity of the flood threat we face." Ratings were provided on a 7-point Likert scale from 1 (not at all) to 7 (extremely), with higher scores indicating more heuristic processing Cronbach's alpha was 0.55 in this study. Concerning these low internal consistency values, scholars have suggested that measuring heuristic processing is relatively difficult because people are reluctant to admit that they quickly form judgments with insufficient information (Trumbo & McComas, 2008). In general, although this measurement tool is not ideal, previous studies showed that it can predict risk perception well (Trumbo & McComas, 2008).

Risk Perception Questionnaire. We used five questions to measure risk perception. Sample items are "During the rainy season in the next five years, if Wuhan is faced with the same rainfall as the summer of 2016, then what do you think is the possibility that Wuhan will encounter urban waterlogging again?" and "During the rainy season of the next five years, if Wuhan again faces the same rainfall as the summer of 2016, how serious do you think the impact of the flood problem will be on Wuhan?" Participants responded to each item on a scale ranging from 1 = "not at all" to 7 = "extremely" ($\alpha = 0.72$).

4.2. Results

Analysis of the Mediation Effect of Information Processing

Government trust significantly associated with heuristic processing (b = 0.28, t = 8.56, 95% CI = [0.22, 0.34], p< .001), supporting Hypothesis 2. However, government trust did not predict system processing (b = -0.02, t = 0.45, 95% CI = [-0.09, 0.05], p = .65), indicating that Hypothesis 3 was not supported. When information processing methods and government trust were both entered into the regression equation, heuristic processing significantly negatively associated with risk perception (b = -0.10, t = -3.15, 95% CI = [-0.17, -0.04],p = .002). Therefore, the mediating effect of heuristic processing in government trust and risk perception was significant, supporting Hypothesis 4. System processing did not predict risk perception (b = -0.00, t = 0.06, 95% CI = [-0.05, 0.05], p = .95), and the mediating effect was not significant; thus, Hypothesis 5 was not supported.

STUDY 3

Study 3 re-examine whether government trust impacts information processing methods and subsequent risk perception.

5.1. Method

5.1.1. Participants

We recruited 200 participants by the Sojump, and excluded those who did not complete all the items, participated in similar studies, or answered the questionnaire in less than 1.5 minutes or more than 5 minutes. Thus, we analyzed the data of 160 effective participants (M_{age} = 23.98 ± 4.91 years; 97 women and 63 men; 75 read low-trust materials and 85 read high-trust materials).

5.1.2. Procedures and Materials

The experiment used a single factorial between-groups design with independent (experimentally introduced

perceived trust), dependent (risk perception), and mediating (system processing and heuristic processing) variables.

Participants were asked to read the low- or high-trust group materials.

The low-trust group read the following: *Facts show that the government is never trustworthy in the face of disaster. In the past, Wuhan City promoted itself as being a "sponge," and that it would be safe from torrential rain. However, in early July 2016, heavy rain hit Wuhan, causing serious waterlogging throughout the city, posing a great threat to people's lives and property. It is understood that in the past few years of urban construction, Wuhan City did not build an underground drainage system. Rather, it took the urban face project as the first development priority. In such an era, what else can be used as a guarantee for the quality of life of the people?*

The high-trust group read the following: *Facts show that the government is always trustworthy in the face of disasters. In early July 2016, torrential rain hit Wuhan. During the disaster, leaders of various levels of government in Wuhan rushed to the front line of flood control and disaster relief day and night, fighting for more than 10 days. After the flood subsided, the Wuhan municipal government held several meetings to demonstrate the urban construction plan, re-drew extreme weather prevention plans, and formulated detailed responsibilities of various departments at all levels to resolutely minimize the flood threats faced by urban residents in the future.*

Thereafter, to test the priming effect, we asked the participants how much they trust the government (the same as Study 1). Then, they competed the information processing method questionnaire, the risk perception questionnaire, and provided basic demographic information. The information processing method and risk perception questionnaires were the same as those in Study 2. In this study, the Cronbach's alpha coefficients of the system processing dimension, heuristic processing dimension, and risk perception questionnaire were 0.78, 0.54, and 0.72, respectively. Finally, participants were informed of the real purpose of the experiment.

5.2. Results

5.2.1. Effectiveness of Government Trust Manipulation

The results revealed that the score of the participants in the high-trust group (M = 5.32, SD = 1.39) and the score of the participants in the low-trust group (M = 4.40, SD = 1.59) significantly differed (t (158) = 3.90, $p < .01$), which shows that manipulating participants' trust in government in this experiment was effective. The high-trust group was coded as a dummy variable ("1"), and the low-trust group was coded as a dummy variable ("0").

5.2.2. Descriptive and Relevant Analysis

SPSS 23.0 was used to describe and analyze the main variable data. The results are shown in Table 1. A significant difference was found in the scores of the high-trust group and the low-trust group for heuristic processing. The high-trust group used heuristic processing more (M = 3.11, SD = 0.68) than did the low-trust group (M = 2.93, SD = 0.57; t (158) = 1.79, p = .08, d = 0.28). The risk perception of the high-trust group (M = 3.42, SD = 0.75) was significantly lower than that of the low-trust group (M = 3.64, SD = 0.50; t (158) = 2.20, p = .03, d = 0.34).

INSERT TABLE 1 ABOUT HERE

5.2.3. Analysis of the Mediation Effect of Information Processing

We test the mediation model again. The results revealed that government trust significantly associated with heuristic processing (b = 0.18, t = 1.79, 95% CI = [-0.02, 0.38], p = .08), supporting Hypothesis 2. However, government trust did not predict system processing (b = 0.06, t = 0.32, 95% CI = [-0.33, 0.46], p = .75); thus, Hypothesis 3 was not supported. When information processing methods and government trust were both entered into the regression equation, heuristic processing significantly negatively associated with risk perception (b = -0.22, t = 2.78, 95% CI = [-0.38, -0.06], p = .006), and the mediating effect

of heuristic processing in government trust and risk perception was significant; thus, Hypothesis 4 was supported. Systematic processing did not predict risk perception ($b = 0.02$, $t = 0.44$, 95% CI = [-0.06, 0.10], $p = .66$), and the mediating effect was not significant; thus, Hypothesis 5 was not supported.

GENERAL DISCUSSION

Flood hazards occur very frequently, and how individuals perceive flood hazards is a critical component for formulating risk communication. People's trust in the government has a great influence on risk perception. In the past, scholars have shared different opinions on whether trust can affect people's risk perception. Siegrist and Cvetkovich (2000) emphasized that trust has an important influence on risk perception; however, this point has been strongly questioned by Sjöberg (2000). Notably, all prior research was conducted in Western countries.

Our research makes at least three key contributions. First, we identified whether trust affects risk perception. Although, according to cultural theory, different cultural groups worry about distinct issues (Douglas & Wildavsky, 1982; Kahan, Braman, Cohen, Gastil, & Slovic, 2010), risk perceptions vary with cultural biases (i.e., worldviews; Wildavsky & Dake 1990) and experience with previous hazards (Kellens, Zaalberg, Neutens, Vanneuville, & De Maeyer, 2011; Lindell & Hwang 2008; Terpstra 2011). Researchers suggest that considering peoples' perceptions, social factors, psychological factors, and culture is essential (Bempah & Øyhus, 2017). Study 1 utilized a real, urban waterlogging risk event as the backdrop and examined the relationship between people's trust in the government and their risk perception. We revealed that the more people believe in the government, the lower their risk perception.

Second, we explored the mechanism between trust and risk perception using flood risk as the backdrop. Studies 2 and 3 used two different methods to jointly test the negative relationship between trust and risk perception using information processing; that is, to answer the question, "How does trust work?", we clarified the importance of trust in risk perception and elucidated the key influential mechanisms.

Studies 2 and 3 showed that the negative correlation between trust in government and risk perception could be explained by information processing methods. During floods, the higher the public's trust in the government, the more they will use heuristics to process risk information; their risk perception will also lower. This result is partly consistent with previous results (Trumbo & McComas, 2003, 2008). Trust is a state of mind, which refers to the possibility of accepting vulnerability (Rousseau, Sitkin, Burt, & Camerer,1998) under the premise of making positive expectations of the intentions or actions of others. This mental state of trust makes it possible to reduce the complexity of things and prevent people from thinking too much about potential risks (Siegrist & Cvetkovich, 2000). People tend to use heuristic processing when they have a high level of trust in the government, thus leading to a lower risk perception (Trumbo & McComas, 2008).

Third, this research found that when government trust is low, people have a higher risk perception; however, this relationship cannot be explained by information processing. Contrary to the conclusion drawn by Tortosa-Edo et al. (2014), which was based on chemical pollution risk. Heuristic processing is more dependent on people's experiences: compared with chemical pollution and nuclear pollution risks, people have more experience with flood risks (Ge et al., 2011); thus, people may have more heuristic processing when facing flood risks. Future research can focus on how different risk events affect people's psychological processing mechanisms.

This study also has some limitations. First, the sample representativeness was limited. Although adult participants were employed in Study 1, the sampling scope was still limited to young populations, the findings cannot be generalized to older populations. Second, this research utilized self-reported information processing methods, which are prone to key biases (e.g., social approval), this may lead very low reliabilities. Future research needs to explore more effective tools to capture participants' information processing. Finally, we did not did not measure trust in information but trust in government. Future research can examine how the trust in information influence information processing and risk perception.

CONCLUSIONS

Government trust can influence risk perception of flood, the higher the public's trust in the government, the more they will use heuristics to process risk information; their risk perception will also lower.

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Table 1 *Descriptive Statistics and Intercorrelations Between Variables (n = 160)*

Variables	**High trust** *M*	**High trust** *SD*	**Low trust** *M*	**Low trust** *SD*	**Comparison between groups** *t*
1. Heuristic processing	3.11	0.68	2.93	0.57	1.79
2. Systematic processing	4.35	1.24	4.29	1.27	0.32

3. Risk perception	3.42	0.75	3.64	0.50	2.20

Note . M = mean, SD = standard deviation.** $p < .01$.