Chinese People's Psychological Reactions to the 2011 Tōhoku Earthquake and Tsunami: Examining the Effect of Media Exposure

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Introduction

On March 11, 2011, a disastrous earthquake with magnitude of 9.0 had hit Japan. Known as the 2011 Tōhoku Earthquake and Tsunami, the powerful earthquakes and tsunami waves caused severe damages including a series of nuclear accidents in the Tōhoku region of Japan. Located in the Circum-Pacific belt, although Japan frequently experiences earthquakes, the 2011 disaster is the greatest one ever recorded in the Japanese history. Earthquake is also a major natural threat to China, and several destructive earthquakes, for instance the 1976 Tangshan Earthquake (M7.8) and 2008 Sichuan Earthquake (M8.0), have left deep marks on Chinese people's memory. Therefore, due to the geographical and psychological proximity between the two countries, the occurrence and consequences of the 2011 Tōhoku Earthquake and Tsunami in Japan attracted considerable attention of the media in China and stimulated empathy among the Chinese people.

Despite how technologically advanced we are, it is still difficult to predict earthquakes. Therefore, strategies for increasing awareness of potential impact and promoting appropriate precautions against natural hazards are considered to be of great importance. Disaster communication is playing a significant role in achieving the goal. It aims not only to provide knowledge but also to influence attitude and behavior so that better decisions and effective responses could be expected during crisis. From this point of view, audience study would provide the most useful information regarding how communications should be designed. Psychological reactions among the public such as risk perception have drawn interest among scholars, which are supposed to largely determine how individuals cope with the real-time situation. Accordingly, the present study focuses on the target in disaster communication, attempting to facilitate a better understanding of individual response to natural hazards.

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Previous findings have informed us that the modern media plays an outstanding role in producing and spreading the knowledge of various hazards (Kasperson et al. 1988; Kitzinger 1999; Stern & Fineberg 1996). The interpretation delivered by the media environment becomes a major determinant of public reaction (Dahlstrom et al. 2012; Miles & Morse 2007; Wahlberg & Sjöberg 2000). Considering the severity and impact of the 2011 Tōhoku Earthquake and Tsunami, the communication of the disaster raises interesting questions regarding the mechanism of media effect. It is worth noting that research on perception of natural hazards has a nearly 50 years' history among the European and North American samples (Lai & Tao 2003). The findings and implications have inspired numerous studies on Asian people (Fukuda 2010; Kung & Chen 2012; Hung & Wang 2011; Lai & Tao 2003; Xie et al. 2011; Xie et al. 2003; Zhang 1994; Zhang et al. 2013). However, analyses in the Chinese context are still rare. Hence, the present study endeavors to add empirical evidence on the psychological effects of disaster communication. Findings are expected to make academic contribution to the literature and provide practical implications for strategies and policies.

Theoretical Perspective: Public Perception and Impact of Social Amplification

Due to the insufficiency of professional skills, the general public is used to rely on diverse internal and external clues to support judgment and decision making (Viklund 2003). Particularly concerning the uncertain and stressful situations such as risk and crisis, people tend to use intuition to reduce cognitive burden and make quick decisions (Slovic et al. 2004; Loewenstein et al. 2001; Finucane et al. 2000). How people subjectively understand and interpret risk is known as *risk perception,* which has become a dominant topic in related fields due to its importance for risk management and policy-making (Lazo et al. 2000).

Regarding the approach to the structure of risk perception, a quantitative framework named psychometric paradigm comes to the fore, which is a landmark in research about public attitudes toward risks. Pioneer study demonstrates that, by identifying people's judgments of varied characteristics of the risk, risk perception can be predicted and quantified (Slovic 1987). First introduced by Fischhoff et al. (1978), the psychometric paradigm has been the most well known and widely used approach. In the study, the researchers compiled 9 contributes that had been hypothesized to construct risk perception, including voluntariness, newness, common-dread, controllability, and severity of consequences. Using the questionnaire methodology, they asked participants to rate 30 hazardous activities on each of the attributes. They obtained two major factors, which were labeled dread and novelty (Sjöberg 2003), explaining a considerable proportion of the variance. The psychometric paradigm, as a cognitive map, has been valued as an "icon"

(Siegrist 2010) for risk perception research and cited by a large amount of follow-up studies. Also, the basic operations of the approach have been replicated many times to group various perceived characteristics of risk into a limited number of factors, which greatly facilitate the analysis of risk perception.

For instance, Slovic (1987) used 9 hypothesized attributes, including dread, familiarity, and controllability, to ask for people's judgment of 81 hazards, including natural hazards, man-made hazards, and hazards in daily life. As a result, two components were obtained and labeled dread risk and unknown risk. Lazo et al. (2000) conducted a survey that illustrated 31 characteristics of perceptions for 25 risks to ecosystem. Four factors, including consequences and controllability, were extracted by factor analysis for comparing risk perceptions of non-experts and ecologists. Aiming to map the psychometric representation of perceptions towards information technology risk, Coles and Hodgkinson (2008) asked survey participants to evaluate 18 risk scenarios by 13 rating scales, including consequences, and got 6 dimensions by weighted multidimensional scaling analysis to reflect the extent to which the various risk scenarios were perceived by IT users. Covello and Sandman (2001) once listed 20 psychological determinants of how people judged risks and processed risk related information. The major factors included controllability, familiarity, catastrophic potential, and dread, which were commonly used in risk perception and risk communication research. Also summed up by Wachinger et al. (2013) in a meta-analysis of 35 research articles regarding risk perception, particularly in connection with natural hazards, judgments of the likelihood, magnitude of a disaster, and catastrophic potential were assumed to have significant explanatory power.

Examples of adopting the psychometric approach are also found in studies using Chinese samples. Zhang (1994) replicated Fischhoff et al.'s method with some changes in the questionnaire for meeting the Chinese situation. The study used 4 attributes, including knowledge, vulnerability, catastrophic possibility, and controllability, to explore Chinese people's perceptions of 20 environmental hazards. The study got 2 factors to explain Chinese people's environmental risk perception. Also following Fischhoff et al.'s work, Lai and Tao (2003) proposed 6 risk characteristics including dread, knowledge, catastrophe, newness, and controllability. They asked 167 Hong Kong Chinese to give quantitative judgments to the characteristics for each of the 25 environmental hazards. This study got a 2-factor structure defined as known-dread risk and controllable risk, which was used for investigating predicted effects of cultural factors on risk perception among Hong Kong Chinese. In order to investigate how experience and gender related to earthquake risk perception, Kung and Chen (2012) interviewed 1,405 Taiwanese through a computer-assisted procedure and asked them to evaluate 8 risk characteristics including dread, knowledge, and damage to property. By factor analysis, 2 factors were yielded and labeled personal impact and controllability,

which were then introduced as the internal structure of risk perception among Taiwanese towards earthquake.

In general, the structure of risk perception varies according to the nature and characteristics of the risk in question. However, in the modern society, to what extent the concept of risk is understood and the characteristics of the risk are identified are largely decided by external influence such as social factors (Beck 1992). The social amplification of risk framework, also known as SARF, has illustrated a conceptual framework to interpret how individual and collective perceptions are shaped within the vast network of communication channels (Masuda & Garvin 2006; Kasperson et al. 1988). Specifically, the SARF suggests a linear model of information flow, which shows the mechanism of encoding and decoding of risk related information by different stations in the network (Kasperson et al. 1988). It has been argued that the process results in not only the amplified or attenuated interpretation of the issue but also the ripple effects on different layers and fields of society (Kasperson et al. 2003). The most prominent feature of the SARF is that it brings individuals and the social context together and investigates the impact of risk from a broader perspective (Masuda & Garvin 2006)). Although empirical support for the SARF is limited (Breakwell & Barnett 2003), the research agenda has been valued as a socially oriented approach and widely applied to explaining public reaction to different hazards.

Among various communication channels, the modern media is believed to be a central force behind the social construction of risk (Miles & Morse 2007; Dahlstrom et al. 2012). Emphasized by the SARF, media is not only one of the channels to transmit risk-related information, but also an important *amplifier* (Kasperson et al. 1988) to alter the audience's interpretation of risk by intensifying or weakening the signals that are part of the information. Among various media formats, traditional media, including newspaper and television, are major information sources for the public, which are supported to have strong impact on people's perception (Lewis & Tyshenko 2009; Kull et al. 2003). For instance, television relying on its technological superiority provides more vivid and sensational contents than newspapers, while newspapers usually contain information with greater breadth and depth than television coverage (Driedger 2007). Along with the rapid development of information and communications technologies (ICTs), the Internet becomes a popular platform for the dissemination of information, which often accelerates the speed of attracting public attention to risk issues (Chung 2011). Comparing with conventional media, the Internet costs less money and effort to access to, owns a larger and longer-term storage of information, and can more easily bypass the geographical limitations.

It is also claimed that what kind of information the audience is exposed to influences media effect. With regard to the risk context, Xie et al. (2003) indicated that people tended to overestimate some risks that were more frequently reported

and ignored other risks that were less covered by the media. Study of Wahlberg and Sjöberg (2000) also asserted that it was the sheer amount of coverage that influenced judgment of risk. In addition, Kitzinger (1999) mentioned that risk reporting was often evaluated by how accurately it reflected experts' assessment, because non-experts' judgment under the risk situation was susceptible to the (perceived) accuracy of relevant information. Although the relationship between information characteristics and psychological reactions is commonly assumed but seldom tested (Dahlstrom et al. 2012). It can be inferred that specific characteristics such as the amount and accuracy could be significant predictors. Therefore, further studies need to be done to achieve more profound understanding of media influence.

The Present Study

Based on the literature, aiming to provide implications to disaster communication, the present study concentrates on the case of the 2011 Tōhoku Earthquake and Tsunami occurred in Japan. Quantitative research methodology has been employed to examine media influence on the audience's psychological responses to the disaster. Although the Chinese people didn't have direct experience of the disaster, owing to its severe consequences and ripple effects, the 2011 Tōhoku Earthquake and Tsunami had attracted great attention of media in the Mainland China, initiating extensive discussion among the Chinese public. Hence, studies on the media's role during a major disaster are expected to contribute insight into the anticipation of public response in similar situations and the improvement of disaster communication. Considering the features of the modern media, particularly during disasters, people's reactions are likely to vary according to what they have learned from the information environment. More importantly, under uncertain situations, people's judgments and decisions are likely to rely on various clues that are easy to access, for instance the modern media (Kahneman 2011). As such, the impact of disaster communication could lead to considerable changes in people's consciousness and behavior, including perception of risk, awareness of the potential impact, as well as emergency preparedness.

Based on the theoretical perspective of the social amplification of risk, the present study is designed to predict earthquake risk perception and impression of Japan that are taken as psychological outcomes of media exposure during the 2011 Tōhoku Earthquake and Tsunami. The process of social amplification could not only affect the public's interpretation of the issue but also cause ripple effects on different aspects of society. For instance, attitudes towards the affected area and people in a disaster would influence tourism and trade. As reviewed before, to explore the role of information characteristics, amount and accuracy as two distinct aspects identified by previous research have been invited to the present study as indicators of the media environment. It is necessary to note that the present study does not intent to

distinguish between the effects of different media. Exposed to the current complex media environment, it is likely that an individual obtains information from multiple sources and channels; accordingly, his or her judgments are supposed to be made based on an overall evaluation of information received. Therefore, the independent variable proposed by the present study is the particular attributes of risk information. In general, it is assumed that high evaluation of the amount and accuracy of information will lead to higher level of earthquake risk perception and intensify feelings about the affected area and people. Thus, the following two hypotheses are proposed in the present study:

H1: Characteristic of information (i.e., amount and accuracy) about the 2011 Tōhoku Earthquake and Tsunami will increase Chinese people's earthquake risk perception.

H2: Characteristic of information (i.e., amount and accuracy) about the 2011 Tōhoku Earthquake and Tsunami will positively influence Chinese people's impression of Japan.

Furthermore, the present study also assumes that information that Chinese people exposed to will positively affect their impression through the mediating role of earthquake risk perception. This assumption aims at discovering a causal pathway through which the varied psychological outcomes are brought into being under the influence of the media. Thus, the third hypothesis was proposed:

H3: The effect of information characteristic (i.e., amount and accuracy) on Chinese people's impression of Japan is mediated by earthquake risk perception.

Method

Procedures and Participants

Data used in this study was collected via an online survey among a convenient sample of the Mainland Chinese. The survey was conducted within one month after the occurrence of the 2011 Tōhoku Earthquake and Tsunami. Questionnaire for the survey was designed to investigate Chinese people's usage of different communication channels (i.e., print media, television, and networked media) for getting relevant information and their psychological reactions to the disaster. The electronic version of the questionnaire (in mandarin Chinese) was created by *Wenjuanxing* (http://www.sojump.com), which is an online survey software commonly used in the Mainland China. An invitation email with the survey introduction and the URL link of the web-based questionnaire was sent out through social networks. During March 30 to April 10, 2011, a total of 220 people had clicked the link, and 213 valid responses had been collected (questionnaire completion rate=96.8%). Among the respondents, 99 are males (46.5%) and 114 are females (53.5%). The majority of respondents (75.1%) belong to the age group of 22-28. Respondents were from 24 cities in the Mainland China, including Beijing

(13.6%), Shanghai (16.0%), and Guangzhou (14.6%).

Measures

First of all, to grasp the choices and preferences of media channels in general, respondents were asked to rate on a 7-point scale (1=*never* and 7=*always*) regarding the extent to which they got information about the 2011 Tōhoku Earthquake and Tsunami from print media (i.e., newspapers and magazines), television, and networked media (i.e., the Internet and social media).

The information characteristic was measured by 6 items asking respondents to rate the degree of the *amount* and *accuracy* of information they got from print media (i.e., newspapers and magazines), television, and networked media (i.e., the Internet and social media) related to the 2011 Tōhoku Earthquake and Tsunami (see Table 1). All the items were rated on 7-point scales (1=*not at all* and 7=*extremely*). Factor analysis was performed to reduce variables. Through the method of principal component extraction, one component was obtained, which was labeled *information characteristic* (6 items, Cronbach's alpha=.91) and explained 69.3% of the variance. Results suggested homogeneity of the coverage on the 2011 Tōhoku Earthquake and Tsunami by different media in the Mainland China. It is necessary to mention that Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) and the Bartlett's test of sphericity were conducted to examine whether the correlations of involving items were suitable for factor analysis. The results indicated that factor analysis was suitable for all the items used in this study that measuring characteristic of information (KMO measure of sampling adequacy=.81>.60; Bartlett' s test of sphericity, $p<.001$).

As aforementioned, risk perception is quantifiable through the approach of psychometric paradigm (Slovic 1987). Studies adopting the psychometric approach have repeatedly confirmed that a substantial part of the variance in risk perception can be explained by a combination of subjective judgments of the characteristics of risk (Chauvin et al. 2007). The explanatory power of the psychometric approach is supported by analyses of samples from diverse social backgrounds. According to the literature (Slovic 1987; Fischhoff et al. 1978; Fischhoff 1995; Viklund 2003), perceived consequence has been identified as a major indicator of non-experts' risk perception. Additionally, considering the nature of natural hazards such as earthquake, perceived likelihood is frequently investigated by previous studies (Ho et al. 2008). Therefore, in the present study, 4 items adopted and modified from previous scales were used to measure respondents' earthquake risk perception. All the items were rated on 7-point scales (1=*not at all* and 7=*extremely*). As expected, two components were extracted and labeled *perceived severity* (2 items, $r=.43$, $p<.01$) and *perceived likelihood* (2 items, $r=.29$, $p<.01$), which explained cumulatively 70.1% of the variance. The results of KMO and the Bartlett's test of sphericity indicated that factor analysis was suitable for all the items measuring

earthquake risk perception (KMO measure of sampling adequacy=.61>.60; Bartlett's test of sphericity, p<.001). Questionnaire items and factor loadings are shown in Table 1.

The present study measured respondents' impression by 8 items that listed in Table 1. All the items were rated on 7-point scales (1=*not at all* and 7=*extremely*). Through factor analysis, two components were extracted, which explained 56.4% of the variance. Factor loadings are shown in Table 1. The results of KMO and the Bartlett's test of sphericity indicated that factor analysis was suitable for all the items measuring impression (KMO measure of sampling adequacy=.82>.60; Bartlett' s test of sphericity, p<.001). According to the 2-factor structure, one represents respondents' feelings about the Japanese society as a whole after the occurrence of the disaster, while the other one represents respondents' feelings about how individuals behaved during the disaster. Therefore, as showed in Table 1, the two components were labeled *impression of Japan* (4 items, Cronbach's alpha=.84) and *impression of Japanese people* (4 items, Cronbach's alpha=.87).

Table 1. Questionnaire Items Measuring Information Characteristic, Earthquake Risk Perception, and Impression

Variable	Item	Factor Loading
Information Characteristic: Amount and Accuracy (α=.91)	Information about the 2011 Tōhoku Earthquake and Tsunami from print media (i.e., newspapers and magazines) is sufficient.	.866
	Information about the 2011 Tōhoku Earthquake and Tsunami from television is sufficient.	.855
	Information about the 2011 Tōhoku Earthquake and Tsunami from television is accurate.	.840
	Information about the 2011 Tōhoku Earthquake and Tsunami from print media (i.e., newspapers and magazines) is accurate.	.840
	Information about the 2011 Tōhoku Earthquake and Tsunami from networked media (i.e., the Internet and social media) is sufficient.	.817
	Information about the 2011 Tōhoku Earthquake and Tsunami from networked media (i.e., the Internet and social media) is accurate.	.772
Perceived Severity (r=.43, p<.01)	Disaster like the 2011 Tōhoku Earthquake and Tsunami will cause devastating damages to society.	.904
	It is hard t recover from a disaster like the 2011 Tōhoku Earthquake and Tsunami.	.646

Perceived Likelihood (r=.29, p<.01)	Major earthquakes like the 2011 Tōhoku Earthquake and Tsunami is likely to happen in China.	.823
	I am likely to encounter major earthquakes like the 2011 Tōhoku Earthquake and Tsunami.	.818
Impression of Japan (α=.84)	Japan is a safe country.	.794
	Japan is able to recover from the 2011 Tōhoku Earthquake and Tsunami.	.745
	The Japanese government disclosed information about the disaster timely.	.737
	The Japanese government was being honest about the consequences of the disaster.	.610
Impression of Japanese people (α=.87)	Japanese people still strictly followed social norms after the occurrence of the 2011 Tōhoku Earthquake and Tsunami.	.781
	Japanese people are very united in dealing with the consequences of the 2011 Tōhoku Earthquake and Tsunami.	.746
	Japanese people kept calm during the 2011 Tōhoku Earthquake and Tsunami.	.694
	How the Japanese people behaved during the 2011 Tōhoku Earthquake and Tsunami deserves praise.	.684

Results

Prior to testing the hypotheses, the present study first examined the effects of print media (i.e., newspapers and magazines), television, and networked media (i.e., the Internet and social media) as information sources on Chinese people's psychological reactions to the 2011 Tōhoku Earthquake and Tsunami. Multiple regressions were performed to investigate the role of three communication channels in influencing earthquake risk perception and feelings about the Japanese society as well as Japanese people. As implied by the results shown in Table 2, print and networked media are likely to be significant predictors of psychological reactions to natural hazards. To be specific, among the three communication channels, print media significantly increased perceived severity of earthquake (β=.24, p<.01) and networked media significantly increased perceived likelihood of earthquake (β=.23, p<.01). Regarding the impact on impression, results only supported the predicted effect of networked media on impression of Japan (β=.11, p<.10) and impression of Japanese people (β=.32, p<.001).

Results suggest that the more people get information from print media such as

newspapers and magazines, the more likely they will perceive the consequences of earthquake to be severe. On the other hand, the more people get information from networked media such as the Internet and social media, the more likely they will believe there is a high probability of earthquake happening. Meanwhile, heavy exposure to disaster related information from networked media could lead to intensified positive feelings about the affected area and people.

Table 2. Effects of Information Sources on Earthquake Risk Perception and Impression

	Perceived Severity	Perceived Likelihood	Impression of Japan	Impression of Japanese people		
	β	β	β	β	*M*	*SD*
Print media	.24**	.08	.10	.08	4.79	1.60
Television	-.04	.12	.14	.10	5.62	1.15
Networked media	.06	.23**	.11 †	.32***	5.80	1.27
R^2	.06	.10	.07	.16		
Adjusted R^2	.04	.09	.06	.14		
F	4.25**	8.13***	5.43**	12.89***		

Note. n=213. † p<.10, **p<.01, ***p<.001.

In order to investigate the effect of information characteristic on the audience's psychological reactions to the disaster, multiple regressions were performed to examine the three hypotheses. The predictor was representing respondents' overall evaluation of the amount and accuracy of information they got from print media (i.e., newspapers and magazines), television, and networked media (i.e., the Internet and social media). The first hypothesis examined the effect of information characteristic on earthquake risk perception. Results in Table 3 showed that the amount and accuracy of information about the 2011 Tōhoku Earthquake and Tsunami significantly increased respondents' perceived severity of earthquake (β=.16, p<.05) and perceived likelihood of earthquake (β=.33, p<.001). Thus, H1 was supported by the data.

The second hypothesis examined the effect of information characteristic on respondents' impression of Japan and Japanese people. As shown in Table 3, the amount and accuracy of information about the disaster significantly increased respondents' impression of the Japanese society (β=.21, p<.01) and their impression of Japanese people (β=.29, p<.001). Therefore, H2 was supported by the data.

Table 3. Effects of Information Characteristic on Earthquake Risk Perception and Impression of Japan and Japanese People

	Perceived Severity	Perceived Likelihood	Impression of Japan	Impression of Japanese people		
	β	β	β	β	*M*	*SD*
Information Characteristic: Amount and Accuracy	.16*	.33***	.21**	.29***	5.51	1.01
R^2	.02	.11	.05	.09		
Adjusted R^2	.02	.11	.04	.08		
F	5.23*	26.50***	9.98**	19.49***		

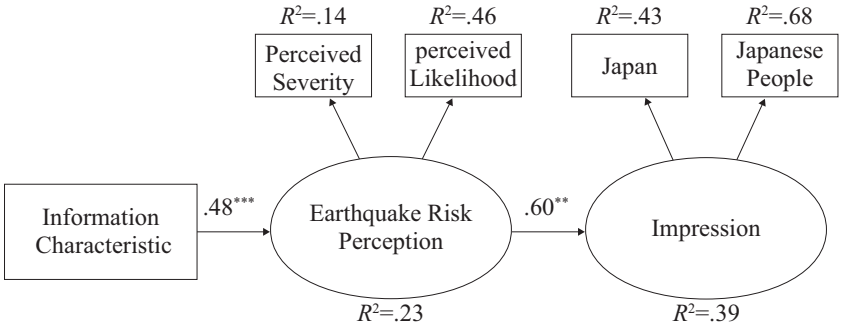
Note. n=213. *p<.05, **p<.01, ***p<.001.

The third hypothesis investigated the mediating role of earthquake risk perception in the relationship between information characteristic and feelings about the Japanese society and Japanese people. Before the mediation analysis, direct effects of perceived severity and perceived likelihood on the two aspects of impression were examined by multiple regressions. Results indicated that both perceived severity (β=.21, p<.01) and perceived likelihood (β=.20, p<.01) significantly increased impression of Japan (R^2=.10, Adjusted R^2=.10, F=12.14, p<.001). In the meantime, only perceived likelihood showed significant predictive power on impression of Japanese people (β=.34, p<.001, R^2=.13, Adjusted R^2=.13, F=16.07, p<.001).

To examine the mediation effect, path analysis under the framework of structural equation modeling was performed. Chi-square value is reported as an index of model adequacy, where a nonsignificant value suggests good model fit. In addition, the comparative fit index (CFI), Tucker-Lewis index (TLI), standardized root mean square residual (SRMR), and the root mean square error of approximation (RMSEA) are reported, which demonstrate how well the specified model explains the data. Values of CFI and TLI range from 0.00 to 1.00, where 0.90 and above represents good fit. SRMR that is equal to or less than 0.05 means good fit. RMSEA value from 0.08 to 0.10 suggests reasonable error of approximation, and the value less than 0.06 indicates perfect model fit. In the resulting path model predicting impression (see Figure 1), estimates indicated good fit: X^2 (3, 213)=5.762, p=.124>.05, CFI=.982>.90, TLI=.939>.90, RMSEA=.066<.08, SRMR=.029<.05. Results of path analysis suggested that effect of information characteristic on

impression was significantly mediated by earthquake risk perception. The standardized indirect effect of information characteristic on impression is .287 (p<.001). Thus, H3 was supported by the data, implying the existence of causal relationships between assorted psychological states associated with disaster situation.

Figure 1: The Resulting Path Model Predicting Impression.



Note. n=213. Estimates are standardized regression coefficients. **p<.01, ***p<.001.

Discussion

Media as the Amplifier of Risk Perception

As the SARF stated, the media is one important amplification station in the social amplification of risk. Since most people get risk-related information from the media (Vasterman et al. 2005), study on the effect of media exposure is expected to contribute insights to the explanation of individual response to risks. In general, as major information sources, print media such as newspapers provide coverage with great breadth and depth, focusing on the development of ideas. Television news uses live reports and videos to attract the audience through affective pathways (Lee & Scheufele 2006). The networked media such as the Internet has risk-related information interpreted in a more broad and diverse way (Krimsky 2007).

Results of the present study show that, during the 2011 Tōhoku Earthquake and Tsunami, print media and networked media as major information sources have shown significant power to influence Chinese audience's psychological reactions. Specifically, the disaster had been amplified by print media in terms of the increase in people's perception of the severity of earthquake. Differently, the networked media increased people's perception of the likelihood of earthquake. Suggested by Xie et al. (2011), perceived likelihood could be strengthened by vivid messages. The networked media provide a considerable amount of pictures and videos that are easy to access, making the users feel more psychologically close to the issue.

Asserted by Freudenburg (1996), media coverage is governed more by an agenda to excite than to inform. Disastrous and dramatic events usually receive a disproportionately large share of media attention. Owing to the severity, the 2011 Tōhoku Earthquake and Tsunami attracted great attention of Chinese media and caused emotional response among Chinese people. Besides information about deaths and economic loss, Japan's advanced relief system and Japanese people's behaviors during the disaster had also been frequently reported (Zhang 2013). Findings of the present study suggested a close linkage between media coverage and the audience's impressions of Japan as well as Japanese people. Although analysis of media effect on impression is particularly designed for the present study, it statistically supports for the assumptions of the SARF, especially the media's role as the amplifier of individual and collective reactions.

Amount and Accuracy: The Role of Information Characteristic in Disaster Communication

Findings about the information characteristic presented a possible way to explain the nature of media effects. The present study assumed that it was specific attributes of media information that would impact the audience's psychological reactions. Generally speaking, results suggested a favorable evaluation from the Mainland Chinese on the amount and accuracy of information related to the 2011 Tōhoku Earthquake and Tsunami (information characteristic: amount and accuracy, M=5.51, SD=1.01, see Table 3).

Data collected within one month after the occurrence of the disaster had perfectly supported the three hypotheses proposed in the present study. Overall, results indicated a promising role of information characteristics in changing the public's judgments under risk situations. Amount and accuracy of information is important. One of the reasons might be because sufficient information that conveyed enough facts about a risk event can provide people a clear image of the situation and help them to establish a comprehensive view of the outcomes and impact. Therefore, people may get motivated to learn more relevant knowledge for preparedness. This assumption is based on several early studies on risk information seeking models, which emphasize that good quality information people received could be incentives on cognition to perform more information seeking behavior (Kellens et al. 2012; Li et al. 2014; Huurne & Gutteling 2008). Further research on the effect of information characteristics is encouraged to develop strategies for the provision of information (e.g., design of message content, selection of communication channels) for communication practice that could promote the public's awareness of risk and precautionary behaviors against potential impact.

In addition, findings of the present study also showed that the amount and accuracy of media information increased positive impression of the affected area and people through the mediation effect of risk perception. More specifically, the larger

amount of and more accurate information about the disaster that people received, the higher their perception of earthquake risk would be, the more positive impression they would have. Because of the close psychological distance to earthquake disaster, it can be explained that the catastrophic Tōhoku Earthquake and Tsunami generated empathy among Chinese people and made them to perceive a higher risk of similar occurrence. Accordingly, people tended to give favorable evaluation of the Japanese society and Japanese people mainly because China's media indeed set agendas to cover more Japan's commendable relief system and Japanese people's behaviors that showing high moral standards during such difficult time (Zhang 2013). Although the current analysis of the path to impression is unique, it allows the potential application of the approach to predicting varied psychological reactions to disasters.

Conclusion and Limitations

The present study intends to investigate how information associated with the 2011 Tōhoku Earthquake and Tsunami from the Mainland China's print media, television, and networked media influences Chinese audience's perception of earthquake risk and impression of Japan. Findings of the present study suggested significant predictive power of the information characteristic (i.e., amount and accuracy) on the public's psychological reactions. To sum up, information from print media were found to increase perceived severity of earthquake, while information from networked media was found to increase perceived likelihood and to enhance people's positive impression of Japan and Japanese people. Regarding the characteristics of information, particularly concerning the amount and accuracy, they were found to play a significant role in contributing to psychological reactions. In addition, the present study also found mediation effect of earthquake risk perception on the relationship between the information characteristic and impression. Findings of the present study provide implications for future research regarding the mechanism of media effect and the provision of risk information in disaster communication.

As important as the findings and implications, several limitations of the present study need to be acknowledged. One of the limitations relates to the measurement of earthquake risk perception. The present study invited perceived severity and perceived likelihood as attributes to explain Chinese people's perception of earthquake risk. It is necessary to note that perception of natural disasters may have other salient characteristics such as perceived dread. In addition, the disaster is also known for a series of nuclear accidents caused by the tsunami. Therefore, people's perception may be constructed by combined feelings about earthquake and nuclear radiation. Future research on the 2011 Tōhoku Earthquake and Tsunami should consider the cross impact of different types of disasters. The second limitation relates to the media formats discussed in the present study. Previous studies (Chung

2011; Krimsky 2007) state that the Internet could be an increasingly important platform for the social amplification of risk because it overcomes time and distance limits that rapidly attracts people's attention to risks. The role of social media should also be paid more attention since it is based on a diverse social network that offers more opportunities for users to gain heterogeneous information from different sources. Therefore, future research is suggested to further investigate how the Internet and social media act upon individual and collective reactions. Future research needs to conduct content analysis of media coverage of disasters, which is expected to enable a more objective summary of how disasters are portrayed by the media. Content analysis could also help to discover the richness of information characteristics regarding disaster reporting, which would facilitate further studies on media effects. Moreover, it would be necessary to conduct dynamic research in the future. Because analysis using cross-sectional data can indicate potential causal relationships but is not persuasive enough to determine the causation. Thus, a series of longitudinal studies on people's perception, awareness, attitudes, and behavioral intentions should be considered.

REFERENCES

BECK Ulrich (1992). *Risk Society: Towards A New Modernity.* Newbury Park, CA: Sage.

BREAKWELL Glynis M. & BARNETT Julie (2003). "The Social Amplification of Risk and the Layering Method". In PIDGEON Nick, KASPERSON Roger E., & SLOVIC Paul (eds.), *The Social Amplification of Risk*. New York, NY: Cambridge University Press. 80-101.

CHAUVIN Bruno, HERMAND Danièle, & MULLET Etienne (2007). "Risk Perception and Personality Facets". *Risk Analysis,* 27(1): 171-185.

CHUNG Ik Jae (2011). "Social Amplification of Risk in the Internet Environment". *Risk Analysis,* 31(12): 1883-1896.

DAHLSTROM Michael F., DUDO Anthony, & BROSSARD Dominique (2012). "Precision of Information, Sensational Information, and Self-efficacy Information as Message-level Variables Affecting Risk Perceptions". *Risk Analysis,* 32(1): 155-166.

DRIEDGER S. Michelle (2007). "Risk and the Media: A Comparison of Print and Televised News Stories of A Canadian Drinking Water Risk Event". *Risk Analysis,* 27(3): 775-786.

FINUCANE Melissa L., ALHAKAMI Ali, SLOVIC Paul, & JOHNSON Stephen M. (2000). "The Affect Heuristic in Judgments of Risks and Benefits". *Journal of Behavioral Decision Making,* 13(1): 1-17.

FISCHHOFF Baruch (1995). "Risk Perception and Communication Unplugged:

Twenty Years of Process". *Risk Analysis,* 15(2): 137-145.

FISCHHOFF Baruch, SLOVIC Paul, LICHTENSTEIN Sarah, READ Stephen, & COMBS Barbara (1978). "How Safe is Safe Enough? A Psychometric Study of Attitudes towards Technological Risks and Benefits". *Policy Sciences,* 9(2): 127-152.

FREUDENBURG William R., COLEMAN Cynthia-Lou, GONZALES James, & HELGELAND Catherine (1996). "Media Coverage of Hazard Events: Analyzing the Assumptions". *Risk Analysis,* 16(1): 31-42.

FUKUDA Mitsuru (2010). *Risuku Komyunikēshon to Media-Shakai Chōsaronteki Apurōchi* [Risk Communication and Media: Approach of Social Science Research]. Tokyo: Hokuju Publications.

HO Ming-Chou, SHAW Daigee, LIN Shuyeu, & CHIU Yao-Chu (2008). "How Do Disaster Characteristics Influence Risk Perception?". *Risk Analysis,* 28(3): 635-643.

HUNG Hung-Chih & WANG Tzu-Wen (2011). "Determinants and Mapping of Collective Perceptions of Technological Risk: The Case of the Second Nuclear Power Plant in Taiwan". *Risk Analysis,* 31(4): 668-683.

HUURNE Ellen Ter & GUTTELINGAAND Jan (2008). "Information Needs and Risk Perception as Predictors of Risk Information Seeking". *Journal of Risk Research,* 11(7): 847-862.

KAHNEMAN Daniel (2011). *Thinking, Fast and Slow.* London: Macmillan.

KASPERSON Roger E., RENN Ortwin, SLOVIC Paul, BROWN Halina S., EMEL Jacque, GOBLE Robert, KASPERSON Jeanne X., & RATICK Samuel (1988). "The Social Amplification of Risk: A Conceptual Framework". *Risk Analysis,* 8(2): 177-187.

KASPERSON Jeanne X., KASPERSON Roger E., PIDGEON Nick, & SLOVIC Paul (2003). "The Social Amplification of Risk: Assessing Fifteen Years of Research and Theory". In PIDGEON Nick, KASPERSON Roger E., & SLOVIC Paul (eds.), *The Social Amplification of Risk*. New York, NY: Cambridge University Press. 13-46.

KELLENS Wim, ZAALBERG Ruud, & MAEYER Philippe De (2012). "The Informed Society: An Analysis of the Public's Information-seeking Behavior Regarding Coastal Flood Risks". *Risk Analysis,* 32(8): 1369-1381.

KITZINGER Jenny (1999). "Researching Risk and the Media". *Health, Risk & Society,* 1(1): 55-69.

KRIMSKY Sheldon (2007). "Risk Communication in the Internet Age: The Rise of Disorganized Skepticism". *Environmental Hazards,* 7(2): 157-164.

KULL Steven, RAMSAY Clay, & LEWIS Evan (2003). "Misperceptions, the Media, and the Iraq War". *Political Science Quarterly,* 118(4): 569-598.

KUNG Yi-Wen & CHEN Sue-Huei (2012). "Perception of Earthquake Risk in Taiwan: Effects of Gender and Past Earthquake Experience". *Risk Analysis,* 32(9): 1535-1546.

LAI Julian Chuk-ling & TAO Julia (2003). "Perception of Environmental Hazards in Hong Kong Chinese". *Risk Analysis,* 23(4): 669-684.

LEE Chul-Joo & SCHEUFELE Dietram A. (2006). "The Influence of Knowledge and Deference toward Scientific Authority: A Media Effects Model for Public Attitudes toward Nanotechnology". *Journalism and Mass Communication Quarterly,* 83(4): 819-834.

LEWIS Roxanne E. & TYSHENKO Michael G. (2009). "The Impact of Social Amplification and Attenuation of Risk and the Public Reaction to Mad Cow Disease in Canada". *Risk Analysis,* 29(5): 714-728.

LI Yiwei, GUO Yu, & ITO Naoya (2014). "An Exploration of A Social-cognitive Framework for Improving the Human-centric Risk Communication". Proceedings of the 11th International ISCRAM Conference, May 2014: 399-403.

LOEWENSTEIN George F., WEBER Elke U., HSEE Christopher K., & WELCH Ned (2001). "Risk as Feelings". *Psychological Bulletin,* 127(2): 267-286.

MASUDA Jeffrey R. & GARVIN Theresa (2006). "Place, Culture, and the Social Amplification of Risk". *Risk Analysis,* 26(2): 437-454.

MILES Brian & MORSE Stephanie (2007). "The Role of News Media in Natural Disaster Risk and Recovery". *Ecological Economics,* 63(2): 365-373.

SLOVIC Paul (1987). "Perception of Risk". *Science,* 236(4799): 280-285.

SLOVIC Paul, FINUCANE Melissa L., PETERS Ellen, & MACGREGORB Donald G. (2004). "Risk as Analysis and Risk as Feelings: Some Thoughts about Affect, Reason, Risk, and Rationality". *Risk Analysis,* 24(2): 311-322.

STERN Paul C. & FINEBERG Harvey V. (1996). *Understanding Risk: Informing Decisions in A Democratic Society.* Washington, DC: National Academy Press.

VASTERMAN Peter, YZERMANS C. Joris, & DIRKZWAGER Anja J. E. (2005). "The Role of the Media and Media Hypes in the Aftermath of Disasters". *Epidemiologic Reviews,* 27(1): 107-114.

VIKLUND Mattias J. (2003). "Trust and Risk Perception in Western Europe: A Cross-national Study". *Risk Analysis,* 23(4): 727-738.

WAHLBERG Anders A. F. & SJÖBERG Lennart (2000). "Risk Perception and the Media". *Journal of Risk Research,* 3(1): 31-50.

XIE Xiaofei, WANG Mei, & XU Liancang (2003). "What Risks Are Chinese People Concerned about?". *Risk Analysis,* 23(4): 685-695.

XIE Xiaofei, WANG Mei, ZHANG Ruogu, LI Jie, & YU Qingyuan (2011). "The

Role of Emotions in Risk Communication". *Risk Analysis,* 31(3): 450-465.

ZHANG Hui (2013). "The National Image of Japan Showed by Reports about '3.11' Earthquake on Global Times". MA thesis, China Youth University for Political Sciences.

ZHANG Jianguang (1994). "Environmental Hazards in the Chinese Public's Eyes". *Risk Analysis,* 14(2): 163-167.

ZHANG Lei, HE Guizhen, MOL Arthur P. J., & LU Yonglong (2013). "Public Perceptions of Environmental Risk in China". *Journal of Risk Research,* 16(2): 195-209.