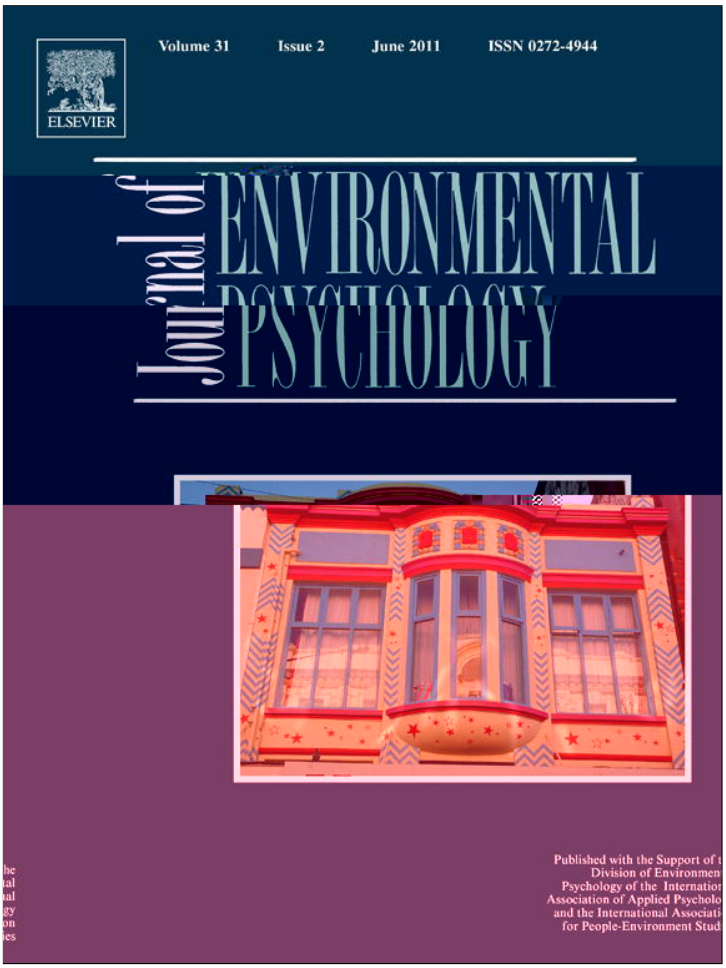

Information source and valence: How information credibility influences earthquake risk perception

Dongqing Zhu [1], Xiaofei Xie*, Yiqun Gan**

Department of Psychology, Peking University, Yi He Yuan Road, Beijing 100871, PR China

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ABSTRACT

The present research aims at the relationship between information credibility and perception of seismic risk in a group of people living in severe disaster areas. 243 adult residents exposed to seismic hazard participated in a questionnaire study. With respect to four types of information which are generated by information sources and valence, participants were instructed to recall one type of the information they obtained respectively and rate the recalled information in terms of its credibility. After that, they were asked to report their seismic risk perception and all socio-demographic data were also collected. Regression analyses suggested that information credibility significantly influenced risk perception. Furthermore, the credibility of word-of-mouth and negative information were positively associated with risk perception. Meanwhile, risk perception was also affected greatly by the credibility of negative public information but not positive word-of-mouth information. It was clear that both information source and valence moderated the process and the latter exerted a stronger influence on it. The results were interpreted in relation to the elaboration likelihood model, accessibility–diagnosticity model, and other cognitive theories. The findings were discussed in terms of their general implications for the improvement of risk communication about earthquake related messages.

1. Introduction

In 2008, the death toll due to the various natural calamities in the world was three times higher than the annual average of 66,813 for 2000–2007, which was mainly caused by two major events: Cyclone Nargis that killed 138,366 people in Myanmar and the Wenchuan earthquake in China that caused the deaths of 87,476 people. Disaster costs in 2008 were more than twice the 82 billion US$ annual average for 2000–2007 and were mainly attributed to the Wenchuan earthquake in China (85 billion US$) and hurricane Ike in the US (30 billion $US) (World Health Organization, 2008). The statistics stated above indicates that earthquakes generally lead to the devastating consequences. Although human power would not allow us to control the occurrence of earthquake, the damage and loss of life it entails are partially controllable by enhancing individuals' response ability.

Risk perception has long been identified and considered as an important predictor of people's adjustment to various kinds of natural hazards (Grothmann & Reusswig, 2006; Peacock, Brody, & Highfield, 2005; Whitney, Lindell, & Nguyen, 2004). Slovic (1987) first suggested that when employing risk assessment to evaluate hazards, the majority of citizens rely on the intuitive risk judgments, typically called "risk perception". Three factors of risk assessment were also extracted: (1) dread risk refers to lack of control, catastrophic potential, fatal consequences, and inequitable distribution of risks and benefits; (2) unknown risk refers to unobservable, new hazards, and delayed manifestation of harm; and (3) a third factor characterizes the number of people exposed to the risk. Since then, researchers have measured risk perception in many different ways. For instance, some researchers asked respondents to assess their level of concern about the hazard (Dooley, Catalano, Mishra, & Serxner, 1992). Other researchers measured risk in terms of the characteristics of the event such as probability and severity (Mulilis & Lippa, 1990), imminence (Mulilis & Duval, 1995), and personal consequences (Lindell &

Chinese urban inhabitants. The result shows certain degree of overlap with the dimensions of risk perception developed from the previous studies. The findings reveal that the risk perception structure for Chinese urban inhabitants contains five factors: controllability, visibility, fearfulness, possibility and severity of risk. Controllability refers to the degree to which individuals can protect themselves, families, and assets from the damage. Visibility characterizes whether individuals are aware of risk and loss in their surroundings. Fearfulness indicates whether individuals are afraid that risk and loss will happen to themselves. Possibility represents how likely individuals think risk and loss will happen to themselves and families. Finally, severity denotes the severity of the consequences resulting from a disastrous accident.

Sometimes governments can efficiently provide risk communication to change individuals' perception about the crisis. Mileti and Fitzpatrick (1992) reported that earthquake risk communication programs in California of the United States had affected residents' risk perceptions. Therefore, the relationship between risk perception and risk communication is of particular interest for this study. Generally, the purpose of risk communication is to change the individuals' awareness by exchange and transmission of risk information. This process includes two kinds of influential factors, the objective characteristics of the information and the individual differences in information evaluation. The latter may play a more direct role in risk communication.

Information credibility is an important aspect of individual's information evaluation. Hirose and Sonehara (2008) coined the term 'information credibility risk' referring to the risk engendered by information or opinions expressed by ordinary individuals on the Internet. They conducted a study based on the avian influenza that occurred in Kyoto in 2004, which was the epitome of misinformation that caused serious damages. In this case, the factor that shows the strong contribution to the harmful impact of rumors was information disseminated via television and newspaper, rather than the World Wide Web. However, in the Internet era, individuals would also be able to quickly and easily spread inaccurate and misleading information to millions of naive Internet users that leads to serious damages.

In brief, information credibility is defi

Hypothesis 2: Information source moderates the relationship between information credibility and risk perception such that word-of-mouth information credibility is positively related to individuals' risk perception, whereas the relationship is not significant for public information credibility.

In the present study, information with different valence refers to the positive and negative nature of the contents of the messages. Negative information has much greater influence over individuals than positive information. For example, people are more confident in negative information; designate more importance to negative information (Siegrist & Cvetkovich, 2001); give more weight to negative information (Taylor, 1991) during decision making; and more reactive to negative information (Fiske, 1992). 'Negativity bias' has been extensively investigated in the field of social and personality psychology, and ample articles have been published in the decision making literature. The *negativity bias* refers to the tendency for humans to pay more attention to negative than to positive information in a wide range of domains, including perception, decision making, and evaluative judgment (Cacioppo & Berntson, 1994; Rozin & Royzman, 2001). After reviewing a broad array of research, Baumeister, Bratslavsky, Finkenauer, and Vohs (2001) concluded that this bias is pervasive in psychological function, and that there are only a very limited number of exceptions (e.g., optimism in predicting the future). Since negative bias exists so widely that it may appear to manifest in all the forms of cognitive processing, earthquake is characterized by high uncertainty that would trigger the negativity bias and the circumstance is likely to push the bias to its extreme form. Therefore, we propose the third hypothesis:

Hypothesis 3: Information valence moderates the relationship between information credibility and risk perception such that negative information credibility is positively related to individuals' risk perception, whereas the relationship is not significant for positive information credibility.

As mentioned above, both variables — information source and valence — could serve as the moderators. However, which variable would play a more crucial role in moderating the relationship between information credibility and risk perception? Siegrist and Cvetkovich (2001) claimed that effect of negative information on individuals' cognition was independent of information source. During cognitive processing of calamitous consequences, individuals are much more likely to pay attention and be vigilance to the negative information emerging during the crisis that overrides the assessment of the information sources. Therefore, we propose the last hypothesis:

Hypothesis 4: Information valence has a stronger moderation effect than information source.

Overall, this study has three major objectives (see Fig. 1): (1) examine the effect of information credibility, namely, to examine whether information credibility has a positive relation with risk perception (Path 1); (2) examine the moderation effects of information source and valence, namely to examine whether the credibility of different sources and different valences information will affect risk perception of public (Path 2 and 3); and (3) explore which variable produces a greater moderation effect, information source or valence (compare Path 2 and 3).

2. Method

On May 12, 2008, a magnitude 8.0 earthquake struck Wenchuan Town in China's densely populated Sichuan Province. The devastating calamity finally resulted in nearly 70 thousand people dead, 18 thousand more buried in debris, 370 thousand wounded, and 85 billion US$ of direct economic loss (Baidu.com, 2005).

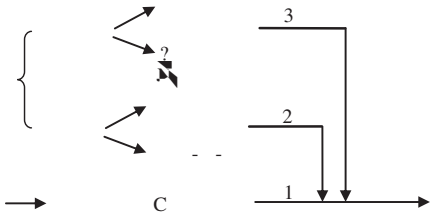

Fig. 1. The objectives of the present study.

This study was conducted in the city of Mianzhu, which is about less than 50 km distant from the quake's epicenter Wenchuan Town and became one of the most severely affected areas after the earthquake. Specifically, "the strong earthquake has killed at least 11,117 people, got 250 lost, injured some 30,000, left around 180,000 homeless and almost razed the whole city to the ground. The considerable economic loss caused by the catastrophe was 142.3 billion *yuan*, including almost 157 industrial factories and other enterprises were all destroyed," the vice mayor of Mianzhu was quoted as saying. After the earthquake occurred, the local inhabitants were settled in temporary tents. The target population consists of only adults living in the tents.

2.1. Participants and procedure

In July 2008, two months after the earthquake, the trained experimenters distributed the questionnaire to 243 adult inhabitants living in the city of Mianzhu. The sample was stratified with respect to age and gender. The overall response rate was 95.9%, of which 227 questionnaires were properly completed, for a completion rate of 93.4%. The final sample consisted of 227 adult respondents, who all had a direct involvement in the May 2008 earthquake.

First, when information sources are interacting with information valence, four types of information are generated: positive public information, negative public information, positive word-of-mouth information, and negative word-of-mouth information. According to these four types of messages above, participants were assigned randomly into four teams ($n = 61$ in the positive public condition, $n = 50$ in the negative public condition, $n =$ in the positive word-of-mouth condition, $n = 58$ in the negative word-of-mouth condition). Next, they were instructed to recall some type of the information they obtained in the earthquake settings and rate the recalled information in terms of its credibility. After that, they were asked to report their seismic risk perception and all socio-demographic data were collected at the end of the questionnaire.

2.2. Measures

2.2.1. Information characteristics

When information source is interacting with valence, four types of information are generated. After participants were assigned randomly into four teams, one of the teams was told to recall one type of information.

2.2.2. Information credibility

Information credibility was investigated with the question asking about an estimation of the accuracy of information available. For example, in the *positive public* condition, people were asked "How credible do you think the *positive public* information you received during the entire earthquake was?" Possible response categories ranged from 1 (not at all) to 7 (very much). Full items are listed in Appendix A.

Table 1
Correlations between the information credibility and risk perception items.

Items	Means	SD	1	2	3	4	5	6
1 Information credibility	3.40	1.92	1.00					
2 Controllability	4.56	1.95	.20**	1.00				
3 Visibility	4.18	2.06	.22**	.52**	1.00			
4 Fearfulness	4.32	2.04	.20**	.38**	.34**	1.00		
5 Possibility	4.97	1.89	.23**	.35**	.39**	.40**	1.00	
6 Severity	4.05	2.07	.19*	.46**	.32**	.42**	.37**	1.00

Note. $*p = .05$. $**p = .01$.

2.2.3. Perception of seismic risk

Based on the five-factor model of risk perception (Liu et al., 2006), we developed a five-item set to inquire about the public perception of seismic risk. The full-item set is listed in Appendix B. Items were introduced with a sentence inviting respondents to think about the past main shock and the present aftershocks. Respondents were asked to report how much they felt appropriate about the relative descriptions. Possible response categories ranged from 1 (not at all) to 7 (very much). A higher score represented feeling more risk. Thus, the measure of risk perception was computed as the sum of the items from this set.

2.2.4. Socio-demographic information

Besides age and gender, all socio-demographic characteristics were obtained at the end of the questionnaire (i.e. gender, age, level of education, family composition, loss of friends or relatives in the 2008 earthquake and damage due to the 2008 earthquake). This section asked participants to report their gender, age and level of education and answer the following questions: How many persons do you live with? Did you lose your friends or relatives in the earthquake? How serious were your houses and assets damaged by this earthquake?

3. Results

Data analysis was conducted as follows. At first, we performed descriptive analyses about the information credibility and perception of seismic risk. Next, we examined correlation coefficients between four types of information credibility, socio-demographic characteristics and perception of seismic risk. The last point was a multivariate analysis: We conducted multiple regression analyses in order to analyze in turn how risk perception (treated as a dependent variable) is related to information credibility.

3.1. Descriptive analyses

Table 1, containing the variable means and standard deviations in the first two columns, displays inter-correlations among the information credibility and risk perception items.

3.1.1. Information credibility

Regarding information credibility, the mean number is 3.40 (S.D. = 1.92). Almost 70% respondents select "4"and downwards, which means 7/10 respondents think the information they received is "not credible"; 22% choose "1", namely, "information is not credible at all", and moreover, this is the highest percentage among all. It appeared that most of the respondents thought of the information they received to be not credible.

3.1.2. Perception of earthquake risk

The average response to the items of the perception of seismic risk is 22.08 (S.D. = 9.99). The Cronbach's Alpha reliability coefficient of items was fit ($\alpha = .90$). The dimension with the highest score is possibility ($M = 4.97$, S.D. = 1.89), followed by controllability ($M = 4.56$, S.D. = 1.95) and fearfulness ($M = 4.32$, S.D. = 2.04). What's more, it should be noted that the highest proportion of respondents selected "7" in all dimensions of risk perception. Specially, there are 78 persons to choose "7" in the dimension of visibility, which indicates that more than 1/3 participants think there would be a great danger around them "all the time".

3.1.3. Socio-demographic characteristics

56% of the respondents were women ($n = 128$) and 44% were men ($n = 99$). Their ages ranged from 19 to 62 years ($M = 35.4$, S.D. = 10.4). In regards to the level of education, 18% had attended secondary school, 24% had a high school diploma, and 58% had a university degree. As for family composition, 52% of the respondents reported living in a household composed of four members, 28% lived with other four persons, and 17% lived with another person, while 3% were single. 48% declared that their assets and houses were damaged badly. Moreover, 32% of the participants lost friends or relatives in the earthquake.

3.2. Correlational analyses

Table 2, with the variable means and standard deviations in the first two columns, displays correlations between four types of information credibility, socio-demographic characteristics and perception of seismic risk. As predicted, positive public and positive word of mouth information had non-significant effects; risk perceptions was significantly correlated with information credibility($r = .21^{**}$), negative public information credibility($r = .42^{**}$), negative word-of-mouth information credibility($r = -.59^{**}$). The negative word-of-mouth information credibility had the positive relation to risk perception with the highest correlation coefficient, suggesting that the negative word-of-mouth information credibility may play an especially significant role in the awareness about natural hazards.

Table 2
Correlations between variables.

Variables	Means	SD	1	2	3	4	5	6	7	8	9	10	11	12
1 Gender	.44	.50	1.00											
2 Age	35.42	10.42	−.08	1.00										
3 Level of education	1.41	.77	.08	−.22**	1.00									
4 Family composition	3.23	1.09	.09	−.17*	−.19**	1.00								
5 Level of damage	1.33	.72	−.07	.22**	−.06	.09	1.00							
6 Loss friends or relatives	.32	.47	.12	.20**	−.09	−.07	−.11	1.00						
7 Information credibility	3.40	1.92	.12	−.11	.01	.06	.00	−.06	1.00					
8 Positive public IC	4.34	1.99	.16	−.00	.18	.05	.07	−.08	–	1.00				
9 Negative public IC	4.10	1.99	.09	−.06	.07	.12	.10	.09	–	−.23	1.00			
10 Positive Word-of-mouth IC	2.91	1.48	−.04	.15	.04	−.28**	.21	.14	–	−.04	.03	1.00		
11 Negative Word-of-mouth IC	2.28	1.39	.11	.05	−.10	.04	.28*	.02	–	.15	−.06	−.19	1.00	
12 Risk perception	22.08	9.88	.08	.03	.04	.02	.16*	.03	.21**	−.01	.42**	.01	.59**	1.00

Note. In order to analyze the correlations between the variables, gender was coded 0 for female and 1 for male; loss of friends or relatives was coded 0 for no, 1 for yes; level of education was coded 0 for secondary education certificate, 1 for senior school diploma; 2 for diploma or university degree; damage during the 2008 earthquake was coded 0 for little, 1 for fairly, 2 for badly. IC = information credibility; $*p = .05$. $**p = .01$.

We also found that the respondents having suffered from greater damage had higher scorings on the risk perception than those who were not subject to such a grievous destroy, consistently with some authors (Miceli, Sotgiu, & Settanni, 2008; Weinstein, 1989). In contrast to the previous studies (e.g., Bassett, Jenkins-Smith, & Silva, 1996; Flynn, Slovic, & Mertz, 1994; Fothergill, 1996), gender differences in risk perception were not found. Neither were the other demographic variables differences. We believed that these surprising results may be related to the catastrophic consequences of Wenchuan earthquake. Just as the opening quotation of this article, the economic loss and death toll caused by this earthquake was so huge that each person who had a personal experience of this horrible event could perceive high level of seismic risk.

3.3. Regression analyses

While controlling for all socio-demographic characteristics, we conducted multiple regression analyses to analyze how risk perception (treated as a dependent variable) is related to information evaluation.

In order to conduct the regression analyses, we recoded the socio-demographic variables. For example, gender: female = 0, male = 1; loss of friends or relatives: no = 0, yes = 1; level of education (Dummy variables: ED1, ED2): secondary education certificate = (0,0), senior school diploma = (1,0), diploma or university degree = (0,1); damage during the 2008 earthquake (Dummy variable: DA1, DA2): little = (0,0), fairly = (1,0), badly = (0,1). We also coded the information characteristics conditions as follows (Dummy variables: IC1, IC2): positive public condition = (1,1), negative public condition = (0,1), positive word-of-mouth condition = (1,0), negative word-of-mouth condition = (0,0).

3.3.1. The effect of information credibility on risk perception

Hierarchical regression analyses were used to assess the relationship between information credibility and risk perception, controlling for the effects of socio-demographic characteristics on risk perception.

We entered the six socio-demographic variables into the first layer, then put information credibility into the second layer. The final model covering socio-demographic variables, information evaluation and risk perception in terms of goodness of fit ($R^2 = .07$) and significance ($F(9,217) = 3.01$, $p < .01$) is reported in Table 3. The most important predictor is the information credibility ($\beta = .24$, $p < .01$), followed by DA2 ($\beta = .18$, $p < .05$). The remaining socio-demographic variables (e.g., age, gender, level of education, family composition, and loss of friends or relatives in the earthquake) did not have significant effects on risk perception.

Table 3
Regression results of information evaluation predicting risk perception.

Variable	Risk perception	
	Step1β	*Step2β*
Gender	−.08	−.05
Age	−.00	.02
ED1	.19*	.16
ED2	.11	.11
Family composition	.02	.01
DA1	.03	.04
DA2	.19*	.18*
Loss of relatives or friends	−.02	−.01
Information credibility		.24**
ΔR^2	.06	.06
$\Delta F(df)$	1.58(8218)	13.76**(1217)
R^2(Adjusted R^2)	.06(.02)	.11(.07)
Overall $F(df)$	1.58(8, 218)	3.01**(9217)

Table 4
Hierarchical regression results of information source moderation.

Variable	Risk perception		
	Step 1β	*Step 2β*	*Step 3β*
Gender	−.08	−.05	−.04
Age	−.00	.02	.01
ED1	.19*	.19*	.19*
ED2	.11	.11	.10
Family composition	.02	.01	.02
DA1	.03	.04	.05
DA2	.19*	.18*	.18
Loss of relatives or friends	−.02	−.01	−.01
Information credibility(IC)		.24**	.39**
Information source(IS)		−.01	−.01
IC × IS			−.23*
ΔR^2	.06	.06	.03
$\Delta F(df)$	1.58(8218)	6.86**(2216)	7.41*(1215)
R^2(Adjusted R^2)	.06(.02)	.11(.07)	.14(.10)
Overall $F(df)$	1.58(8, 218)	2.70**(10,216)	3.21**(11,215)

The results demonstrated that the higher information credibility was, and the greater the damage people experienced, the greater was the risk they perceived. The results supported Hypothesis 1.

3.3.2. The moderation effects of information source and valence

Hierarchical regression analyses were used again to assess the moderation effects of information source and valence in the relationship between information credibility and risk perception.

To test Hypotheses 2 and 3, we performed two separate moderated hierarchical regression analyses. In the first step, we regressed risk perception on the six socio-demographic variables. In the second step, we entered information source and information credibility after they were centered, which means creating a deviation score by subtracting a variable's mean from each of the raw scores (i.e., $xi = Xi - M$) (e.g., Aiken & West, 1991). Then, in the third step, we entered the product of the centered information credibility and information source or valence to the equation.

The results of the hierarchical regression analyses, which are presented in Tables 4 and 5, provided preliminary support for Hypotheses 2 and 3 in that the interaction terms of information credibility and information source or valence were significantly related to risk perception ($\beta = -.23$, $p < .05$; $\beta = -.35$, $p < .01$). To examine the pattern of relationships, we plotted the significant interactions.

Fig. 2 depicts the relation between the credibility of different sources information and risk perception. Post hoc analyses demonstrated that, as expected, there was a positive relationship only between word-of-mouth information credibility and risk perception ($\beta = .30$, $p < .01$), but the relationship was not significant for public information credibility ($\beta = .16$, $p > .05$).

Fig. 3 depicts the nature of the relationship between the credibility of different valences information and risk perception. Supporting Hypothesis 3, there was a positive relationship between negative information credibility and risk perception ($\beta = .47$, $p < .01$), but no relationship for positive information credibility ($\beta = .03$, $p > .05$).

3.3.3. Comparison between the two moderation effects

Results (see Tables 4 and 5) above demonstrated that information valence have a stronger moderation effect than information source ($\Delta R^2 = .06 > \Delta R^2 = .03$; $\beta = -.35 > \beta = -.23$). As we could expect, negative word-of-mouth information credibility exerted a significant influence on risk perception ($\beta = .57$, $p < .01$). Besides, negative public information credibility also affect risk perception significantly ($\beta = .39$, $p < .05$), but positive word-of-mouth information credibility did not ($\beta = .01.$, $p > .05$). The results supported Hypothesis 4.

Table 5
Hierarchical regression results of information valence moderation.

Variable	Risk perception		
	Step 1β	*Step 2β*	*Step 3β*
Gender	−.08	−.05	−.05
Age	−.00	.02	.02
ED1	.19*	.18*	.19*
ED2	.11	.12	.11
Family composition	.02	.01	.01
DA1	.03	.04	.03
DA2	.19*	.18*	.17
Loss of relatives or friends	−.02	−.01	−.01
Information credibility(IC)		.25**	.50**
Information valence(IV)		−.05	−.05
IC × IV			−.35**
ΔR^2	.06	.06	.06
$\Delta F(df)$	1.58(8218)	7.13**(2216)	14.77**(1215)
R^2(Adjusted R^2)	.06(.02)	.12(.07)	.18(.13)
Overall $F(df)$	1.58(8, 218)	2.76**(10,216)	4.01**(11,215)

4. Discussion

4.1. Results analyses

The present study aims at a better understanding of the relationship between risk communication and risk perception. Two kinds of important influential factors of risk communication, individuals' information evaluation and information characteristics, have close relationship with risk perception. Results indicated that information credibility had a great effect on risk perception. We also found that the credibility of word-of-mouth and negative information was positively associated with risk perception, and information valence had a stronger influence than information source.

Hypothesis 1 was supported by the significant regression analysis of respondents' evaluation on information credibility with their perception of seismic risk. This finding suggests that information credibility affects risk perception significantly, and implies that it is far from enough for the respondents to get some pieces of information. What people urgently need is the information with high credibility. This result also shows that ELM model may account for the power of information credibility in individuals' information processing after the earthquake. Confronting much less information, people would have high subjective motivation and maybe use the central route to understand and process information.

The result of Hypothesis 2 indicates that the credibility of word-of-mouth information positively affects risk perception, which makes it clear that the inherent advantage of word-of-mouth information reflected by the accessibility–diagnosticity model, such as its personal, vivid, detailed natures, could attract attention, evoke emotion and then change perception. For this reason, it can be very easy for word-of-mouth information to amplify its effect.

The results of Hypothesis 3 and 4 confirm that negative information credibility has a positive correlation with individuals' risk perception, especially the credibility of negative word-of-mouth information with the strongest power of prediction. The result that people are more sensitive to negative information than positive information was consistent with the many previous studies. The severe seismic environment intensified the negative bias tendency in individuals' perception. In comparison with information source, information valence plays a much more significant role. Beyond this, the profound impact of negative word-of-mouth information may result from the objective situations and victims' mental needs.

4.2. Practical implications

The results of descriptive analyses of information credibility manifest that 22% complained that "information is not credible at all". In this condition, how can we take advantage of information to change individuals' perception of risk? The result of Hypothesis 1 indicates that it is effective to increase information credibility for enhancing the effect of risk communication which in turn changes individuals' risk perception.

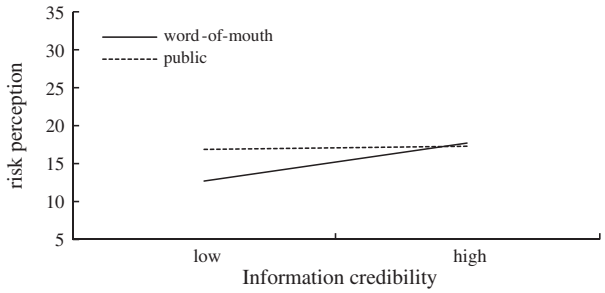

Fig. 2. Information source moderation effect.

After the earthquake, the government at all levels devoted much attention to information disclosure, but the publicity announced by news media does not play a great role in the masses. The result of Hypothesis 2 also demonstrates the credibility of publicity failed to affect the individuals' risk perception. This phenomenon may be attributed to the destroyed mass media system by the earthquake. The public eking out a living could hardly gain the information from news media, which may enormously cripple the influence of publicity.

In the light of Hypothesis 3, is it necessary to lower the risk perception by intentionally hiding the true negative information from the public? Generally speaking, higher levels of perceived risk increase protection motivation (Floyd, Prentice-Dunn, & Rogers, 2000; Neuwirth, Dunwoody, & Griffin, 2000). Conversely, a low risk perception may lull people into a false sense of security and, as a result, cause them to ignore the risk as a threat that should be heeded (Johnston, 1999). For this reason, it is not so wise to conceal the true negative information, because this kind of action will blind people and then make them give up the self-protective measures. Without doubt, the false negative information is another issue. Therefore, the rational attitude should be held towards the true negative information.

Based on Hypothesis 4, the negative word-of-mouth information could partly be attributed to harmful rumors, defined as "unverified and instrumentally relevant information statements in circulation that arise in contexts of ambiguity, danger, or potential threat and that function to help people make sense and manage risk" (DiFonzo & Bordia, 2007). From our data, we can also see the rumors' special function in individuals' risk management. This is an interesting phenomenon. Individuals considered the credibility of negative publicity higher than that of negative word-of-mouth ($M = 4.10 > M = 2.28$, $F(1,106) = 31.15$, $p < .01$). However, the prediction power of negative word-of-mouth exceeded that of negative publicity (the former: $\Delta R^2 = .30$, $p < .01$; the later: $\Delta R^2 = .14$, $p < .01$). This means even though they have too much

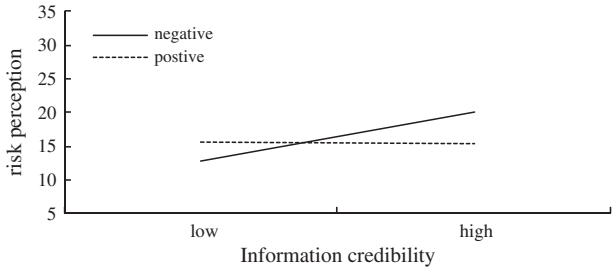

Fig. 3. Information valence moderation effect.

sense to believe the negative word-of-mouth information, in order to safeguard themselves and families from danger, they would still rather accept than refuse it. From this we infer that rumor transmission may be related to individuals' overprotection. The results of regression analyses also show that the respondents, having suffered from greater damage, are more prone to the effect of negative information.

4.3. Limitations and future directions

The results of this study are referred to as conditioned a specific physical-environmental context. Indeed, we investigated the local residents who had personal experienced the May 2008 earthquake two months after the tragic event. Thus, it may possibly be doubted whether our findings could be generalized to other researches. However, because of the same characteristics the earthquake shares with other fatal crises, our conclusions could, to a great extent, illustrate how information evaluation of credibility works upon the individuals' perception in the crisis environment.

In addition, we have explored the effects of information evaluation during the whole earthquake event, so future researches could try to verify the impacts of information evaluations in the decision-making scenarios. Furthermore, personality is another factor to predict the perception and judgment, and special conditions may magnify individual difference, hence future researches could also take notice of the two-factor interaction of the personality and information evaluations.

5. Conclusion

In conclusion, it is worth noting that this study has some important implications not only on a theoretical level, but on an application level as well. This study illuminates the influences of information credibility, and reveals the roles of information source and valence in the process, contributing in turn to reducing the vulnerability of individuals and society and improving the management of communication and information on environmental hazards in the threatening events.

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Appendix A. Different types of information sufficiency and credibility

t ve b c (egat ve b c, t ve w d- f- th egat ve w d- f- th) ; .
1. H credible t ve b c (egat ve b c, t ve w d- f- th egat ve w d- f- th) ? ? [illegible] 1 2 3 4 5 6 7

Appendix B. Perception of seismic risk

; .
1. (C t ab t): H ? ? [illegible] 1 2 3 4 5 6 7
2. (V b t): H ? ? [illegible] 1 2 3 4 5 6 7
3. (Fea f e): H ? ? [illegible] 1 2 3 4 5 6 7
4. (P b t): H ? ? [illegible] 1 2 3 4 5 6 7
5. (Se e t): H ? ? [illegible] 1 2 3 4 5 6 7

References

Aiken, L., & West, S. (1991). *Testing interactions in multiple regression*. Mahwah NJ: Lawrence Erlbaum.

Baidu.com. (2010, July 5). *Wenchuan earthquake*. Retrieved July 5, 2010, from. http://baike.baidu.com/view/1587399.html%3Fhold%3Dredirect%231.

Bassett, G. W., Jenkins-Smith, H. C., & Silva, C. (1996). On-site storage of high level nuclear waste: attitudes and perceptions of local residents. *Risk Analysis, 16*, 309–319.

Baumeister, R. F., Bratslavsky, E., Finkenauer, C., & Vohs, K. D. (2001). Bad is stronger than good. *Review of General Psychology, 5*, 323–370.

Cacioppo, J. T., & Berntson, G. G. (1994). Relationship between attitudes and evaluative space: A critical review, with emphasis on the separability of positive and negative substrates. *Psychological Bulletin, 115*, 401–423.

Collins, C. J., & Stevens, C. K. (2002). The relationship between early recruitment-related activities and the application decisions of new labor-market entrants: A brand equity approach to recruitment. *Journal of Applied Psychology, 87*, 1121–1133.

DiFonzo, N., & Bordia, P. (2007). *Rumor psychology: Social and organizational approaches*. Washington DC: American Psychological Association. pp. 3–4.

Dooley, D., Catalano, R., Mishra, S., & Serxner, S. (1992). Earthquake preparedness: Predictors in a community survey. *Journal of Applied Social Psychology, 22*, 451–470.

Farazmand, A. (2001). *Handbook of crisis and emergency management*. NewYork: Marcel Dekker, Inc.. pp. 3–6.

Feldman, J. M., & Lynch, J. G. (1988). Self-generated validity and other effects of measurement on belief, attitude, intention, and behavior. *Journal of Applied Psychology, 73*, 421–435.

Fiske, S. T. (1992). Thinking is for doing: Portraits of social cognition from daguerreotype to laserphoto. *Journal of Personality and Social Psychology., 63*, 877–889.

Floyd, D. L., Prentice-Dunn, S., & Rogers, R. W. (2000). A meta-analysis of research on protection motivation theory. *Journal of Applied Social Psychology, 30*, 407–429.

Flynn, J., Slovic, P., & Mertz, C. K. (1994). Gender, race, and perception of environmental health risks. *Risk Analysis, 14*, 1101–1108.

Fothergill, A. (1996). Gender, risk, and disaster. *International Journal of Mass Emergencies and Disasters, 14*, 33–56.

Grothmann, T., & Reusswig, F. (2006). People at risk of flooding: Why some residents take precautionary action while others do not. *Natural Hazards, 38*, 101–120.

Herr, P. M., Kardes, F. R., & Kim, J. (1991). Effects of word-of-mouth and product-attribute information on persuasion: An accessibility–diagnosticity perspective. *Journal of Consumer Research, 17*, 454–462.

Hirose, Y., & Sonehara, N. (2008). Management of information-credibility risk in an ICT society: A social implementation. *Internet Research, 18*, 142–154.

Hoye, G. V., & Lievens, F. (2005). Recruitment-related information sources and organizational attractiveness: Can something be done about negative publicity? *International Journal of Selection and Assessment, 13*, 179–187.

Johnston, D. (1999). Volcanic hazard perceptions: Comparative shifts in knowledge and risk. *Disaster Prevention and Management, 8*, 118–126.

Kim, Y., Lacina, M., & Park, M. S. (2008). Positive and negative information transfers from management forecasts. *Journal of Accounting Research, 46*, 885–908.

Lindell, M. K., & Whitney, D. J. (2000). Correlates of household seismic hazard adjustment adoption. *Risk Analysis, 20*, 13–25.

Liu, J. P., Huang, H. Q., & Zhou, G. Y. (2006). A research on the risk perception of urban inhabitants. *Psychological Science (China), 29*, 1439–1441.