Examining the influence of social media on individual's protective action taking during Covid-19 in China

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ABSTRACT

In the context of COVID-19, this study utilizes the Social Mediated Crisis Communication Model (SMCC) and the Protective Action Decision Model (PADM) to investigate the relationship between social media users' protective actions and crisis information during public health crises in China. By constructing a structural equation model, this study aims to identify the influencing factors that affect social media users' personal's cognitive, emotional, and behavioral reactions given crisis relevant information. Results findings are that warning information can significantly increase risk perception; emotional responses are not significantly affected by warning information and risk perception; risk perception has a negative impact on information gathering and sharing behavior; risk perception has a significant mediating effect on the relationship between information features and protective action.

Keywords

Public crisis, Social Mediated Crisis Communication Model, Risk perception, Protective action.

INTRODUCTION

The rapid dissemination of social media based on social relations and the strong public demand for information have made social media an important means of information acquisition during public crises (Lei Weizhen & Wang Tianjiao, 2008). Social media not only provides a platform for public communication during crises but is also widely used by governments to publish crisis information, making social media a crucial tool for communication, emergency response, information mining, and crisis management (Veil et al., 2011).

Previous research suggests that the release of crisis information through the media can significantly shape the public's cognition and influence their actions in response to the crisis. While traditional media played a central role in the dissemination of information during past public health crises such as the SARS outbreak in 2003 (Richard, 2006), our understanding of how social media platforms impact information dissemination and influence individuals' actions during major health crises is still limited (Y. Yang et al., 2021).

Individuals' perceptions of risk are heavily influenced by the exchange of information through social media, which, in turn, can influence their protective actions during crises (Krewski et al., 2005). Moreover, the way information is obtained can affect individuals' risk perception and emotional state, which can influence their protective actions (Tang Xujun, 2020). The perceived degree of information and risk perception based on the information acquisition platform can impact individuals' information gathering and sharing behavior on social media platforms such as Weibo (Hong Xiaojuan et al., 2016). However, the relationships among information gathering and sharing behavior, information features and psychological factors, and their effects on individual protective action in a crisis remain to be investigated.

Thus, this study aims to identify the influencing factors that affect social media users' personal's cognitive,

emotional, and behavioral reactions given crisis relevant information. The research questions for this study are as follows: RQ1: How does crisis information dissemination impact individual risk perception and emotional response? RQ2: How do individual risk perception and emotional response influence their protective action during a crisis? This study was built upon the Social Mediated Crisis Communication Model (SMCC) and the Protective Action Decision Model (PADM).

THEORETICAL FOUNDATION

The Protective Action Decision Model

Lindell and Perry (2012) proposed the Protective Action Decision Model (PADM), which is a comprehensive model used to explain the public's response to threatening events such as environmental hazards and disasters. Initially, PADM was used to understand protective behavior during emergency situations, but it was later expanded to explain people's response to long-term disaster threats. PADM is primarily applied to imminent or long-term environmental hazards and disasters, as it highlights the basic causal chain from risk information to behavioral response through psychological perception (Wei Jiuchang, 2020; Lindell & Perry, 2012).

PADM emphasizes the importance of risk perception, which refers to an individual's judgment and estimation of the probability of threat, as well as the potential adverse physical and social effects that could occur. Risk perception is the key variable in predicting an individual's behavioral response to environmental hazards and disasters within PADM (Fan Chunmei et al., 2019). Overall, the PADM model provides a valuable framework for understanding the complex decision-making process of individuals when faced with environmental hazards and disasters.

The Social Media Crisis Communication Model

The Social Media Crisis Communication Model (SMCC) is a theoretical framework developed based on the Blog Mediated Crisis Communication Model (BMCC), which was proposed by Jin and Liu (2010) as a roadmap for responding to influential blogs before, during, and after a crisis. The SMCC was later modified to reflect that crises can be triggered and spread through a variety of social media platforms and offline social interactions. This model primarily focuses on the impact of the relationship between the crisis information channel and the information source on consumers' crisis communication behavior (Lucinda et al., 2016).

The SMCC has broad applicability in the crisis field, and numerous studies have been conducted to compare the information sources and forms of the model. For example, Liu et al. (2016) noted that information sources are a crucial factor in evaluating information credibility. From a public perspective, Van der Meer and Jin (2020) identified three influential sources of crisis information: organizations, news media, and social peers. Given the information challenges affecting health behaviors, Santosh (2015) highlighted the responsibility of government health agencies and other organizations in providing timely information to affected communities and leading the fight against disinformation. Expert sources such as the Centers for Disease Control and Prevention (CDC) were found to be particularly effective in correcting health misinformation (Vraga & Bode, 2017). The news media is considered a central area of crisis negotiations and can play a leading role in establishing and ending a crisis, while peer audience groups can both spread misinformation and expose individuals to more accurate information (Bode & Vraga, 2015).

RESEARCH MODEL AND HYPOTHESIS DEVELOPMENT

Research Model

Based on the SMCC and PADM, the model is constructed as presented in Figure 1. The proposed model is designed to investigate how information dissemination impacts people's actions during a crisis, specifically in social crisis scenarios. In order to explore this relationship, the risk perception construct from the PADM model is integrated into the SMCC model. The objective is to determine how different sources and forms of warning information impact people's risk perceptions and subsequently influence their protective actions. The variables of information dissemination that are included in the model are the warning information source and content. The dependent variables being investigated are the individual's information gathering and sharing behavior, as well as the protective actions taken by them. Additionally, the model aims to study the mediating effects of risk perception and emotional response on the relationship between information dissemination and people's reactions during the crisis.

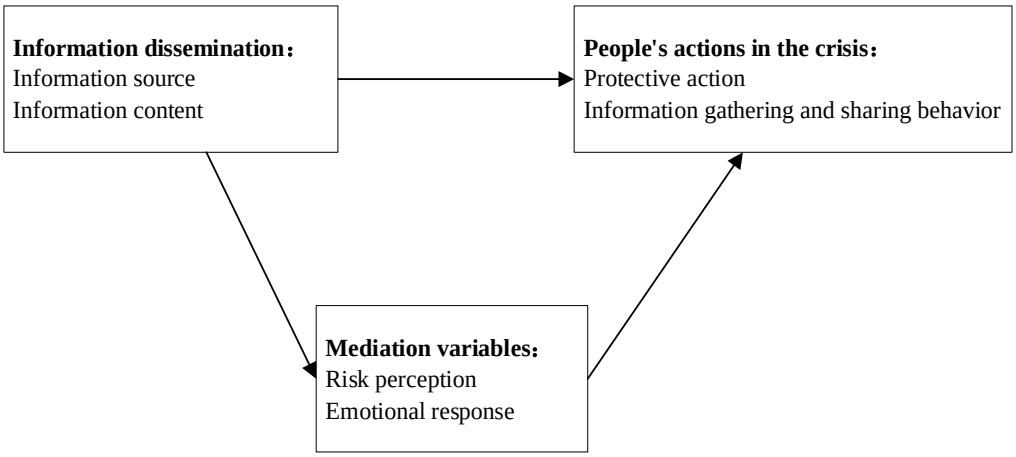

Figure 1. Research Model of Social Media User Protection Behavior

Hypothesis

Information features

Previous studies have demonstrated that risk perception is influenced by the type of warning information that people receive. The authority of the source providing the warning information and the content of the information can impact people's perception of risk. Specifically, warnings from more authoritative sources are likely to be perceived as more credible, leading to a greater perceived risk. In contrast, personal accounts with emotional content may result in greater emotional arousal, but may not be perceived as credible sources of information, resulting in lower perceived risk. Thus, the following hypotheses are proposed:

H1a: The authority of the warning information source is positively correlated with individuals' risk perception.

H1b: The authority of the warning information source is positively correlated with individuals' emotional response to the crisis.

Social media provides a platform for risk communication and information sharing.

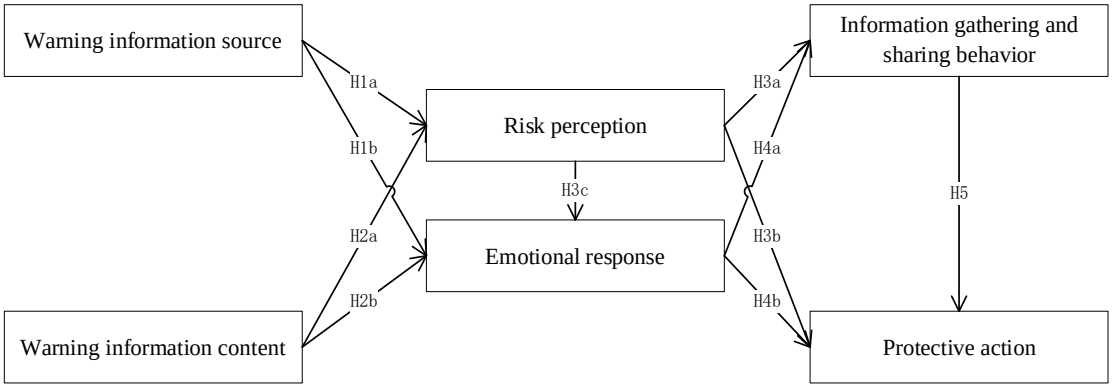

Figure 1. Model hypothesis

However, excessive information can lead to psychological desensitization and apathy, resulting in avoidance of risk and negative emotions such as anxiety and depression. Therefore, the richness of the content of the warning information may affect how people respond to it. In particularly, information that provides more details about the crisis may increase the perceived risk and emotional response. Conversely, information that lacks details may result in reduced emotional response and perceived risk. Therefore, the following hypotheses are proposed:

H2a: The richness of the content of the warning information received is positively correlated with individuals' risk perception.

H2b: The richness of the content of the warning information received is positively correlated with individuals' emotional response to the crisis.

Risk perception and emotional responses

The present study hypothesizes that risk perception influences both information seeking behavior and protective action of individuals during a crisis. Previous research has shown that changes in risk perception can lead to emotional responses such as fear, which may increase information demand and result in information seeking behavior (Deng & Liu, 2017). In the case of health emergency events, the level of risk perception can affect the choice of protective action by individuals. Higher risk perception may lead to excessive protective action, while lower risk perception may reduce individual awareness of protection. Based on this, the following hypotheses are proposed:

H3a: The individual's level of risk perception is positively related to their information gathering and sharing behavior.

H3b: The individual's level of risk perception is positively related to their protective action.

H3c: The individual's level of risk perception is positively related to their emotional response.

Emotions play an important role in influencing individuals' responses to crisis information. Negative emotions, such as fear, anxiety, and sadness, are commonly experienced by individuals in crisis situations and can impact their decision-making processes (Van der Meer et al., 2014). Studies in the field of health and risk communication have demonstrated that negative emotions can directly or indirectly affect perceptions of vaccine risks and potential health risks (Yang et al., 2012). Conversely, positive emotions can improve personal trust in health information and directly influence behavior related to potential health risks.

Previous research has categorized crisis-related emotions as either attributable-dependent or attributable-independent. Attributable-dependent emotions have been linked to negative relationship outcomes, information processing, and disclosure behavior, while attributable-independent emotions may lead to supportive behaviors and positive relationship outcomes (Jin et al., 2016). Building upon these findings, we hypothesize the following:

H4a: The individual emotional response is positively correlated with the information gathering and sharing behavior.

H4b: The individual emotional response is positively correlated with the protective action.

Individual Behavior

Previous research has established a relationship between information seeking behavior and protective actions in the context of avoiding harm during crises (Brooke et al., 2019). However, it remains unclear whether there is a direct link between information gathering and sharing behavior and the intention to take protective action. Thus, we propose the following hypothesis:

H5: There is a positive correlation between an individual's information gathering and sharing behavior and their protective action.

RESEARCH METHOD

The study utilized a longitudinal design and collected data through questionnaires, which were analyzed using structural equation modeling to test the hypothesis. Most previous research on the phasing of structural equation modeling has focused on the task stage or on the staging of a particular assessment system. However, due to the multi-point and multi-temporal nature of the COVID-19 crisis, the current study divided the research into two stages based on the first outbreak and stabilization of the COVID-19 pandemic in China.

The early stage (Stage I) was from January to April 2020 when people were generally unaware of COVID-19. Key events during this stage included the emergence of "pneumonia of unknown origin" reported in the People's Daily, the implementation of comprehensive prevention and control measures, the introduction of precise preventive and control measures such as "health codes", and the gradual resumption of production. The late stage (Stage II) was from May to December 2020 when the pandemic was gradually brought under control within China. Key events during this stage included further progress in resuming production, a shift towards protection against offshore risks, and the development of the COVID-19 vaccine by Pfizer stopping 90% of infections.

The questionnaire survey for this study was conducted in December 2020 using an online questionnaire survey method (https://www.wjx.cn/) for data collection. To improve recovery efficiency and quality, the questionnaire was explained, and material rewards were provided to those who filled in the questionnaire effectively. A total of 430 questionnaires were distributed, 69 invalid questionnaires were excluded according to the filling time, and 361 valid questionnaires were recovered, resulting in an effective recovery rate of 83.95%.

The questionnaire (see Appendix) used in this study was divided into two parts: The first part was personal information and users' use of social media, including basic information about gender, age, and education level. The second part was the scale part, which included influencing factors and outcome variables, such as information source, information content, risk perception, emotional response, information gathering and sharing behavior, and protective action variables under the crisis. All basic information was measured using the Likert scale, and the conceptual model in this paper included 6 latent variables, each consisting of 4-7 observed variables, all derived from existing literature (Chu Yajie et al., 2020; Lau et al., 2010; Lai Zedong, 2014).

To improve the validity of the questionnaire, the study tested the initial questionnaire's predictability before large-scale distribution. According to the results of the pretest survey, the reliability and validity of each variable measure item were analyzed, and the questionnaire was finalized after moderate adjustment. A total of 12 observation questions were assigned 1-5 points according to the feelings of social media users.

DATA ANALYSIS

The study utilized SPSS26.0 and Amos26.0 for statistical analysis, which was conducted in five steps: descriptive statistical analysis and correlation analysis, testing the deviation between distinguishing validity and common methods, modeling and scaling, regression analysis to test the intermediary role of risk perception and emotional response, and discussion of the research results. The early stage of COVID-19 was named stage I, and the later stage was named stage II in the study.

Descriptive analysis

A descriptive analysis was conducted using SPSS26.0 to examine the age, gender, number of resident members, and educational qualifications of the respondents. The findings are presented as follows:

Table 1. Descriptive analysis of the samples

Demographics	Category	Frequency	Percentage (%)
Age	<18	4	1. 11%
	18-25	119	32.96%
	26-30	69	19. 11%
	31-40	125	34.63%
	41-50	32	8.86%
	51-60	10	2.77%
	>60	2	0.55%
Gender	male	190	52.63%
	female	171	47.37%
People living together	Solitary	53	14.68%
	Spouse	222	61.5%
	Children	176	48.75%
	Parents	124	34.35%
Education level	Primary	2	0.55%
	Lower Secondary	2	0.55%
	High School/Secondary	34	9.42%
	Undergraduate/ College	284	78.67%
	Postgraduate(Masters/PhD)	35	9.7%
	Other	4	1. 11%

Reliability and Validity Analysis

In conducting variance-based structural equation modeling (SEM), it is necessary to test for dataset invariance when the data contains multiple groupings, as noted by Luo et al. (2020). Given that our data was collected in two different stages or scenarios, we first performed a test for measurement invariance before conducting a summary analysis. To do so, we utilized the MICOM procedure proposed by Henseler (2016), while maintaining the same

algorithm settings across all three cases.

To establish partial measurement invariance, the original composite correlation should be greater than or equal to the 5% quantile. Our results indicate that all latent constructs have partial measurement invariance. However, not all structures had the same mean across all cases, indicating a lack of complete measurement invariance. As such, we were unable to analyze the combined data across the two stages.

Table 2. Loading&AVE&CR

Construct		Loading		AVE		CR	
	Item	Stage I	Stage II	Stage I	Stage II	Stage I	Stage II
Information source	A1	0.796	0.731	0.5449	0.5023	0.8564	0.8342
	A2	0.671	0.682				
	A3	0.770	0.766				
	A4	0.706	0.692				
	A5	0.741	0.668				
Information content	B1	0.814	0.782	0.622	0.8312	0.7489	0.7834
	B2	0.731	0.795				
	B3	0.818	0.635				
Risk perception	C1	0.560	0.659	0.6849	0.7871	0.8098	0.805
	C2	0.712	0.786				
	C3	0.667	0.759				
	C4	0.821	0.641				
Emotional response	D1	0.913	0.906	0.814	0.9066	0.7916	0.8973
	D2	0.949	0.944				
	D3	0.931	0.923				
	D4	0.956	0.948				
	D5	0.745	0.704				
Protective action	E1	0.663	0.619	0.7445	0.7055	0.7857	0.7525
	E2	0.705	0.576				
	E3	0.630	0.665				
Information gathering and sharing	F1	0.685	0.691	0.6553	0.6235	0.8418	0.8102
	F2	0.738	0.731				

In this study, different procedures and criteria were utilized to test the measurement quality of reflexive and formative constructs. For the formative constructs, the measurement quality was assessed following the recommendations of MacKenzie (2005) and Diamantopoulos (2001). The significance levels of the path weights of the four formative constructs were examined, and the variance inflation factors (VIF) were calculated to assess multicollinearity between the first-order factors in each formative second-order construct. According to the criterion for discriminating multicollinearity proposed by Diamantopoulos (2001), a VIF value higher than 10 indicates the presence of multicollinearity. However, the VIF values of the formative constructs in this study were below the threshold of 10, and the VIF values of all formative constructs at both stages were less than 2, indicating the absence of multicollinearity.

The quality of measurement of the reflexivity scale was assessed in terms of reliability, convergent validity, and discriminant validity. Good reliability is indicated when the combined reliability (CR) is above 0.7 and the average variance extracted (AVE) is above 0.5 (Bagozzi and Yi, 1988). The results indicated that the CR and AVE of all the reflexivity scales were above the recommended reliability thresholds, and the combined reliability values were generally above 0.7, while the average variance extracted values were generally above 0.6, indicating good reliability.

Convergent validity was assessed based on the factor load, and a significant factor load greater than or equal to 0.6 indicated good convergent validity of the questionnaire. However, the third construct risk perception (C1_I) did not show significant factor loads on its respective potential structures, and its factor load was less than 0.6. Thus, C1_I was removed, and the data analysis was revisited. The results showed that most of the constructs had

factor loads greater than 0.7, indicating good convergent validity for all of the reflection scales.

To assess discriminant validity, we examined the correlation matrix of the constructs (Tables 4 and 5) where the square root of the average variance extracted (AVE) for each construct should be greater than the correlation between constructs (Fornell & Larcker, 1981). The results in Tables 4 and 5 showed that the square root of all AVEs was higher than the inter-construct correlations, indicating that all reflexive constructs demonstrated good discriminant validity. These findings were consistent in both the pre-pandemic and post-pandemic periods, indicating good discriminant validity of the data in both stages.

Table 1. Stage I

Variable	Mean	SD	1	2	3	4	5	6
Information source	3.401	0.614	**0.738**					
Information content	4.318	0.669	0. 172**	**0.789**				
Risk perception	3.765	0.729	0.263**	0.396**	**0.828**			
Emotional response	3.500	1.148	0.230**	0. 164**	0.311**	**0.902**		
Information gathering and sharing	4.257	0.681	0.221**	0.572**	0.303**	0. 199**	**0.863**	
Protective action	2.530	1.215	-0.219**	-0.206**	-0.235**	-0.205**	-0.228**	**0.810**

Note: The diagonal number is the square root of the AVE value. The non-diagonal number is the correlation between potential constructs.

Table 2. Stage II

Variable	Mean	SD	1	2	3	4	5	6
Information source	3.401	0.614	**0.709**					
Information content	4.018	0.672	0.228**	**0.912**				
Risk perception	3.307	0.799	0.257**	0.365**	**0.887**			
Emotional response	3.000	1.076	0. 175**	0. 138**	0.456**	**0.952**		
Information gathering and sharing	4.053	0.676	0. 156**	0.448**	0.225**	0.040	**0.840**	
Protective action	3.219	1.316	-0. 162**	-0.250**	-0.292**	-0.255**	-0. 144**	**0.790**

Note: The diagonal number is the square root of the AVE value. The non-diagonal number is the correlation between potential constructs.

Mediation effect test

In order to investigate the mediating effects of risk perception and emotional response, an alternative model was tested to examine the direct effects of exogenous variables without the influence of these mediating variables. The alternative model included only the source and content of the warning information, and explained only 19% to 36% of the variance in protective actions, compared to 61% to 63% for the entire model. Similarly, the alternative model explained only 23% to 28% of the variance in information gathering and sharing actions, compared to 40% to 52% for the entire model. These findings underscore the significant role of risk perception and emotional response in explaining protective actions and information gathering and sharing behaviors in the study's data sample.

To examine the mediating effects of risk perception and emotional response, the method proposed by Shrout &

Bolger (2002) was used, as it has greater statistical power than traditional methods. This involved assessing three paths: (1) the path from the independent variable (i.e., warning information content) to the mediating variable (path A); (2) the path from the mediating variable to the protective action or continued collection and sharing of information (path B); and (3) the direct path from the independent variable to the dependent variable (path C or C', tested alongside the indirect path involving paths A and B). A sample of five thousand bootstraps was generated in SPSS, and indirect effects were calculated for each piece by multiplying the coefficients for Path A and Path B. A 95% percentile interval was constructed for the indirect and direct impacts.

Table 3. Mediation effect test

Stage	Independent variable	Mediation variable	Dependent variable	Indirect impact(AB) 2.5% lower boundary value	Indirect impact(AB) 97.5% upper boundary value	Indirect impact(AB) =0?	Direct impact (C') 2.5% lower boundary value	Direct impact (C') 97.5% upper boundary value	Direct impact (C') =0?	Intermediary type
Stage I	Information source	Risk perception	Information gathering and sharing behavior	-0.237	-0.073	NO	-0.255	-0.086	NO	Partial
		Emotional response		-0.582	-0.163	NO				Partial
	Information content	Risk perception		-0.260	-0.040	NO	-0.385	-0.097	NO	Partial
		Emotional response		-0.633	-0.106	NO				Partial
	Information source	Risk perception	Protective action	0.106	0.256	NO	0.085	0.218	NO	Partial
		Emotional response		0.041	0.521	NO				Partial
	Information content	Risk perception		-0.022	0.140	YES	0.444	0.711	NO	NO
		Emotional response		-0.029	0.407	YES				NO
Stage II	Information source	Risk perception	Information gathering and sharing behavior	-0.326	-0.124	NO	-0.258	-0.024	NO	Partial
		Emotional response		-0.832	-0.283	NO				Partial
	Information content	Risk perception		-0.292	-0.081	NO	-0.473	-0.163	NO	Partial
		Emotional response		-0.833	-0.285	NO				Partial
	Information source	Risk perception	Protective action	0.047	0.206	NO	0.024	0.179	NO	Partial
		Emotional response		-0.215	0.295	YES				NO
	Information content	Risk perception		-0.025	0.127	YES	0.325	0.578	NO	NO
		Emotional response		-0.242	0.141	YES				NO

To determine the presence of indirect and direct effects, a zero-containing interval test was used, with a non-zero interval indicating a significant result. A full mediation was identified when the indirect effect was non-zero and the direct effect was zero, while a partial mediation was identified when both the direct and indirect effects were non-zero. The findings of the mediated effects test are presented in Table 6. Overall, the mediating variables of emotional response and risk perception did not produce a significant mediation effect between information content and protective action. Otherwise, the mediating results from both risk perception and emotional response were

found to be partial mediators.

The mediating effects test yielded several important findings. Firstly, the inclusion of the mediating variables, namely risk perception and emotional response, significantly increased the predictive power of the dependent variable. Secondly, while risk perception partially mediated the effects of both information source and content, emotional response did not mediate the effects of information content on protective action. Finally, the results indicated that risk perception was the most influential and consistent predictor of protective action adoption. These findings highlight the critical role of risk perception in shaping individuals' decision-making and behaviors in response to warning information. Furthermore, the study's findings suggest that emotional responses may play a more nuanced role in shaping information processing and decision-making in certain contexts.

Discussion

The findings of hypothesis testing using SPSS and AMOS are presented in Figure 3, which summarizes the results of the data analysis. The results indicate that in the early stages of the COVID-19 pandemic, the source of warning information was significantly and positively associated with risk perception ($r=0.251$, $p<0.05$), and the content of warning information was significantly and positively associated with risk perception ($r=0.531$, $p<0.001$), providing initial support for hypotheses H1a and H2a. In the later stages of the pandemic, warning information was significantly and positively correlated with risk perception ($r=0.303$, $p<0.05$), warning information content was significantly and positively correlated with risk perception ($r=0.420$, $p<0.001$), and risk perception was significantly and positively correlated with emotional response ($r=0.040$, $p<0.05$). These results provide initial support for hypotheses H1a, H2a, H3a, and H3c.

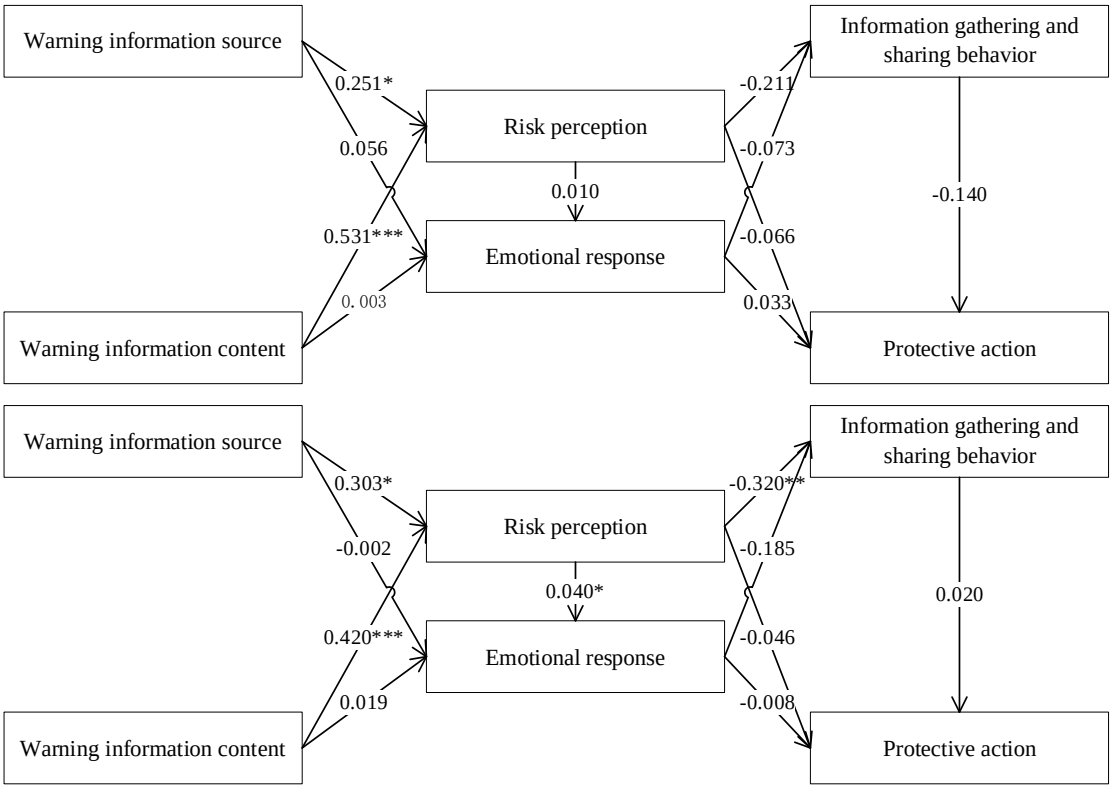

Figure 2. Test results for model of stage I and stage II.

CONLUSION

In this study, a longitudinal approach was used to investigate the mechanism by which individuals develop protective actions based on their use of social media for information gathering and cognition formation during the COVID-19 outbreak in China. The study was conducted in two stages, allowing for a comparison of the impact of social media during different stages of the crisis. Results indicate that, for both stages, individuals' risk perception of the public health crisis was significantly associated with the authority of the information and its richness. However, no significant relationships were found between individuals' emotional response and the information source and content richness for either stage.

The main difference between the two stages was that, in the later stage, risk perception had a negative impact on

individuals' information-gathering and sharing behavior. Furthermore, for both stages, no significant correlations were found between individuals' protective action and their risk perception or emotional response.

The current study seeks to expand the literature on the relationship between information features and protective action in social crises. Prior research has primarily focused on organizational crises, and the current study moves beyond this narrow scope to incorporate a major public crisis scenario, which involves more complex people and response patterns. By incorporating social media crisis communication theory, this study explains how information factors influence the path of protective action, and extends the scope of application of social media crisis communication theory, confirming its adaptability. Moreover, this study aims to identify the sources of psychological problems faced by the public during crises, and investigate the mechanisms behind these problems, whether they arise from crisis information itself or differences in information transmission channels.

Furthermore, this study provides a longitudinal analysis of multi-point multiple events in their overall development, highlighting the importance of the crisis severity in information dissemination. This analysis sheds light on how crisis severity affects people's reactions to the crisis, in addition to the role of information features and psychological factors. Overall, the current study contributes to the literature on managing crises using social media, providing insights into the complex relationship between information features, psychological factors, and protective action.

The present study employed a specific set of social media platforms, including WeChat, Weibo, and social video software, to investigate the impact of warning information on risk perception and protective actions during the COVID-19 pandemic. To further advance this area of inquiry, future research could examine the effects of different social media platforms on these outcomes and compare the differential effects across platforms. Such endeavors can provide more nuanced guidance for crisis communication strategies during pandemics. Furthermore, future research can build upon the theoretical framework proposed in this study and adopt innovative methodological approaches to collect data from multiple sources that can shed light on actual behavior. This can facilitate a more comprehensive understanding of the complex interplay between social media, information features, and protective actions in public health crises.

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APPENDIX

1. Your age:

2. Your gender:

3. Family members who live with you:

4. Your education level:

A - Sources of warning information

1 - Zero frequency of use, 2 - Low frequency of use, 3 - Proficient in use, 4 - High frequency of use, 5 - High degree of reliance.

5. Please select the degree to which you relied on the following social media platforms (such as WeChat, Weibo, Zhihu, etc.) during the COVID-19 pandemic.

● WeChat ● Weibo ● Question and answer communities ● Internet forums ● Video Platform

B - Warning information content

1-Almost no attention paid, 2-Low level of attention paid, 3-Moderate level of attention paid, 4-High level of attention paid, 5-Very high level of attention paid.

6. Please choose the level of attention to the following information types in the early/late stage of COVID-19:

- Updates on the COVID-19 pandemic, such as information on symptoms, modes of transmission, number of infections, and information on individuals infected.

- Knowledge on COVID-19 prevention measures, such as protective measures and healthy habits.
- Regional information, including the current situation of regions affected by the pandemic and detailed information on the pandemic in one's own region.

C - Risk Perception

1 - Not serious, 2 - Not too serious, 3 - Serious, 4 - Very serious, 5 - Extremely serious.

7. Your perceived severity of COVID-19 in the early/late stage:

- The severity level of the pandemic itself.
- The severity level of adverse consequences caused by the pandemic.

D - Emotional response

1 - Strongly disagree, 2 - Somewhat disagree, 3 - Neutral, 4 - Somewhat agree, 5 - Strongly Agree.

8. Did you have the following reactions during the COVID-19 pandemic?

- Emotional abnormalities: depression, anxiety, fear, tension, sadness, hopelessness, irritability, helplessness, restlessness, and weak willpower.
- Behavioral abnormalities: restlessness, social anxiety, avoidance, binge eating or refusing to eat, reticence, and self-blame.
- Cognitive abnormalities: slowed perception, lack of concentration, memory decline, difficulty thinking, poor judgment, extreme thinking, reduced work efficiency, arbitrary inference and extension.
- Physiological abnormalities: dizziness, nausea, chest tightness, shortness of breath, difficulty breathing, palpitations, insomnia, nightmares, loss of appetite, high blood pressure, rapid heartbeat, increased adrenaline, central nervous system excitation, and reduced immunity.
- No such reactions.

9. Please select the level of the reactions you have experienced during the early/late stage of COVID-19 pandemic:

- Emotional abnormalities
- Behavioral abnormalities
- Cognitive abnormalities
- Physiological abnormalities

E-Protective Action

10. Please select the level of compliance with the following actions during the early/late stage of the COVID-19 pandemic:

- Maintaining good hygiene habits: frequently washing hands with soap (or hand sanitizer containing alcohol) and running water; avoiding touching eyes, mouth, and nose with dirty hands; covering mouth and nose with a tissue or elbow when coughing or sneezing; regularly ventilating indoor spaces and carrying out cleaning and disinfection.
- Personal protective measures compliance: Minimize gatherings and avoid crowded places; maintain one-meter social distancing with others; wear a mask when taking public transportation or in crowded places as required; show health codes and cooperate with temperature monitoring in public places; actively cooperate with nucleic acid testing according to epidemic prevention and control requirements; seek medical attention promptly if experiencing symptoms such as fever and cough.
- Maintaining a healthy diet: advocate for separate meals and use of communal spoons and chopsticks; meat and seafood should be thoroughly cooked; do not consume wild animals.

F-Information gathering and sharing behavior

11. Please evaluate your information-gathering behavior during the early/late stage of the COVID-19 pandemic.

- After the outbreak of the COVID-19 pandemic, I actively searched for relevant information.
- I frequently gathered the latest information on the COVID-19 pandemic from the internet.
- I paid attention to news coverage of the COVID-19 pandemic.

- I paid attention to the latest developments of the COVID-19 outbreak.
- If someone told me some information about the COVID-19 pandemic, I would spend some time listening.

12. Please evaluate your information-sharing behavior during the early/late stage of the COVID-19 pandemic.

- If I learned some new information about the COVID-19 pandemic, I would like to share with others voluntarily to avoid being affected by it.
- I was proactive in discussing the information about the COVID-19 pandemic with others.
- I would love to share my knowledge and opinions about the COVID-19 pandemic with others.
- I would participate in discussions when others are discussing the COVID-19 pandemic.

I would not actively discuss the COVID-19 information with others, but I would pay attention when others were discussing around.