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Study on the influencing factors of rumor sharing behavior: the regulating effect of critical thinking

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Statement

Abstract

Since the outbreak of the global public health crisis, research on the factors influencing the spread of rumors related to this disease has become increasingly complex. This study conducts an empirical analysis based on the SOR (Stimulus-Organism-Response) model, aiming to explore the effects of online and offline information searching on the fear of COVID-19. It also examines how this fear affects the rumor-sharing behavior of college students, comparing the role of critical thinking in moderating these factors.The study uses a sample of 720 college students through a questionnaire survey. The results indicate that both online and offline information searches promote fear of COVID-19 among college students. This heightened fear, in turn, positively influences their tendency to share rumors. Critical thinking enhances the positive effect of online information searching on fear and the impact of fear on rumor-sharing behavior. This research advances the integration of rumor-sharing behavior with the SOR model through an analysis of critical thinking. It provides practical insights into the psychological characteristics of college students and the government's efforts in rumor control.

1. Introduction

Will be coronavirus as a global epidemic, in the early 2020 full outbreak in China, not only affects the psychological attitude in peoples daily life, and promote the human research on disease rumors sharing behavior, to a certain extent, the people for the disease cause, prevention and cure of rumors and error information spread widely on social media. Governments at all levels quickly realized that rumor spreading had a big impact on Peoples Daily lives because it spread faster than official news and was more difficult to trace. For example, in China, rumors about the cure for the disease usually spread quickly, leading to social instability, and rumors about the regional epidemic have greatly affected the travel and work of local residents. Due to the widespread spread of unofficial rumors of the disease and the sharp increase in the number of rumors, there is a great panic and unclear perception of the disease. Therefore, it is of research significance to explore the influencing factors of people about the rumor-sharing behavior.

Especially in the group of college students, this phenomenon is particularly obvious. As an important group in the society, college students have a high education level and strong social media use habits, but their ability to judge and screen information still needs to be further improved. During the COVID-19 period, college students were not only the audience of rumors, but also one of the main groups of rumor sharing. College students have a wide social network, the information spreads quickly, and they have a strong thirst for knowledge and a desire to share new information, which makes them play an important role in the spread of epidemic rumors.

Previous studies often failed to focus on the perspective of college students and information sources. The uniqueness of college students lies in their high-frequency use of social media and the acceptance of new technologies, which makes them have characteristics different from other groups in the rumor transmission chain. Moreover, the credibility and type of information sources also play a crucial role in the spread of rumors. Studies have shown that different sources of information (such as official media, social media, friend recommendations, etc.) have a significant impact on peoples trust and willingness to share information. Therefore, combining the characteristics of college students and the perspective of information sources, studying their rumor sharing behavior during the epidemic period can not only help to understand the mechanism of rumor dissemination, but also provide a basis for the formulation of effective rumor prevention and control strategies.

The research innovation point of this paper is to focus on college students and their critical thinking. Due to their educational background and growing environment, college students often have certain critical thinking ability, which makes them have a unique cognitive and processing way when facing information. By studying the rumor sharing behavior of college students during the epidemic and the critical thinking behind it, we can more fully understand their characteristics in the process of information screening and sharing, and provide targeted suggestions for

reducing the spread of rumors. Taking these factors into account, we can get a more comprehensive understanding of the rumor-sharing behavior of college students during the epidemic period, and provide targeted suggestions for reducing the spread of rumors.

2. Theoretical research and research hypotheses

2.1 SOR model

The SOR model, the stimulus-organism-response model, was proposed by Woodworth (1929), an extension of the classical stimulus-response model of Pavlov (1927). The theoretical framework holds that specific environmental factors can influence individual emotional and cognitive states, leading to specific behavioral outcomes. The model consists of three core components: stimulus, organism, and response. Stimulation refers to the environmental factors affecting the organism, including various external information and events; the organism represents the cognitive and emotional state of the individual, and is the key process between mediating stimulus and individual response; the response is the final behavior and result of the organism after stimulation. Studies have shown that the SOR model is very effective in explaining individual behavior and is widely used in various fields. For example, the model is used to study the rumor spreading and refuting behavior during the COVID-19 epidemic. In this kind of research, by analyzing how environmental information (stimulus) affects the emotional and cognitive state (organism) of college students, and then determines their rumor refuting behavior (response), we try to reveal the internal relationship between environmental factors and individual behavior.

In the SOR theory, "S" represents the stimulus (Stimulus), and in this study, we understand it as the content of online information search and offline information search. Online information search refers to the Internet and digital technology to obtain information through search engines, social media, news websites, online databases, scientific journals and official websites. The advantages of this approach are the fast speed of information acquisition, diverse information types and instant access, enabling individuals to access the latest and relevant extensive information at any time. However, online information search also faces the challenge of information overload and unreliable information. False information, rumors and misleading content on the Internet may lead individuals to make wrong judgments, and even aggravate fear and anxiety.

Offline information search refers to obtaining information through traditional channels in a non-virtual environment, such as face-to-face communication, attending community meetings, reading newspapers and magazines, watching television news, or participating in expert lectures. Offline information search emphasizes the credibility and authority of information, enabling individuals to obtain verified information from authoritative organizations, professionals or

trusted media sources. For example, attending lectures held by public health departments or reading reports in professional journals can help individuals accurately understand the epidemic and protective measures, thus reducing fear and improving decision-making rationality.

In short, online and offline information search, as "stimuli" in SOR models, affects the cognitive and emotional state of "organisms" (i. e., individuals) by providing different kinds and forms of information, and then determines their final behavioral response. In public health events such as epidemics, these information search behaviors are especially important because they not only affect the quality and credibility of individual access to information, but also are directly related to the degree of individual fear of the epidemic and the choice of response measures.

In the framework of SOR theory (stimulus-organism-response), "organism (O)" refers to the cognitive and emotional state of individuals, which plays a role in connecting the preceding and the following in the face of stimuli. In public health events, "fear", as a strong emotional response, is one of the important elements of the organism (O) part. Fear is often triggered by individuals perception and interpretation of the epidemic, which further affects their behavioral responses.

In the SOR model (stimulus-organism-response), O refers to the "organism". In this model, the organism (O) is between the stimulus (S) and the response (R), influencing how the individual processes the external stimuli and ultimately forms a behavioral response. The organism part includes the internal state of the individual, such as emotions, cognitive processes, motivation, and psychological characteristics.

In this study, the organism (O) mainly refers to the individuals fear during the outbreak. This fear is triggered by the perceived risk of virus transmission, infection risk, and treatment measures. And as a key factor in the organism (O), fear profoundly affects the way individuals interpret and respond to information. Specifically, fear drives individuals to frequently search for epidemic-related information for a sense of security, however, excessive information search may instead reinforce fear, especially in the face of inaccurate or negative information. Moreover, fear weakens the individuals ability to think critically, making it easier to trust unconfirmed news and rumors.

Therefore, in the framework of the SOR model, the organism (O) part was defined as the fear felt by the individual during the outbreak. This fear not only affects the individual information processing mode, but also has a significant impact on the spread of rumors and information search behavior. By understanding and analyzing this level, it is helpful to propose targeted interventions, such as enhancing the publics critical thinking ability, to reduce the negative impact of misleading information and fear.

In the SOR model, "R" (response) represents the behavior or response of an individual after

facing the stimulus (S) and processing through its internal state (O, body). This response can be any form of behavior, speech, emotional expression, or information transmission.

In this study, "R" specifically refers to the rumor-sharing behavior during a public health crisis (e. g., COVID-19). This behavior is driven by fear (O), and individuals search for information motivated to understand and control the threat of an epidemic. Due to the complex and changeable sources of online information, it is vulnerable to inaccurate or negative information, while offline information search is limited by the accuracy and authenticity of information through traditional channels. When it is difficult to distinguish the true and false information, individuals are more likely to share rumors under high pressure and strong emotions. The lack of fear-driven information search behavior and critical thinking ability make rumors spread more quickly and widely. Understanding these mechanisms can help to develop more effective strategies to reduce rumor spread and enhance the publics discrimination in the flood of information.

2.2 Information search and fear

Information search refers to the process in which individuals actively seek information in order to solve specific situations, meet information needs or solve problems. This process often involves locating, acquiring, evaluating, and using information to help individuals make decisions, learn new knowledge, or solve problems. Information search behavior is not only limited to the acquisition of information, but also includes the evaluation of information accuracy and relevance, as well as the integration and application of information. The whole process is influenced by multiple factors, such as personal knowledge background, trust degree, and information availability and accessibility.

Information search can be divided into two forms: online information search and offline information search according to the channels of obtaining information. Online information search uses the Internet and digital technology to obtain information through platforms such as search engines, social media, news websites, online databases, scientific journals and official websites. It has the advantages of rapid, diverse information and instant access, enabling people to access the latest information anytime and anywhere. However, online information search also faces the challenge of information overload and unreliable information. False information, rumors and misleading content on the Internet may lead individuals to make misjudgments and aggravate panic. In addition, online information search behavior is often influenced by social circles, and in public health events, peer behavior and attitudes significantly affect the individual information search behavior and emotional responses of individuals.

Offline information search is mainly conducted through traditional channels in non-virtual environments, such as face-to-face communication, attending community meetings, reading newspapers and magazines, watching TV news, or attending expert lectures. Offline information

search emphasizes the credibility and authority of information, allowing individuals to obtain verified information from authoritative organizations, professionals, or trusted media sources. For example, attending lectures organized by public health authorities or reading professional publications can help individuals accurately understand epidemic information and protective advice. Offline information search behavior also relies on individual social networks and group interactions, and their cognitive, and emotional responses are influenced by others opinions and attitudes when interacting with peers, family members or community members. In general, both online and offline information search methods play an important role in information acquisition, credibility and impact on individuals.

The online information search used in this paper refers to the reliance on the Internet and digital technology, using platforms such as search engines, social media, news websites, online databases, scientific journals and official websites to obtain information. Its advantages are fast speed, information diversity and instant access, enabling individuals to access the latest information anytime and anywhere. However, online information search also faces problems with information overload and unreliable information reliability. False information, rumors and misleading content on the Internet can lead individuals to make misjudgments and increase fear.

The offline information search used in this paper refers to the non-virtual environment mainly through traditional channels, including face-to-face communication, attending community meetings, reading newspapers and magazines, watching TV news, or participating in expert lectures. Offline information search emphasizes the credibility and authority of information, enabling individuals to obtain verified information from authorities, professionals or trusted media sources. For example, attending lectures organized by public health departments or reading reports in professional publications can help individuals get accurate information about outbreaks and preventive measures.

Fear is a strong emotional response, often triggered by a perceived threat or danger. This emotion can lead to excessive worry, anxiety and restlessness, and individuals can have a significant impact on their daily life and mental health. Fear can not only change an individuals emotional state, but may also drive them to adopt a range of self-protective behaviors, such as increasing vigilance and performing more exploratory behaviors (such as searching for information), in order to gain a sense of security and control.

In this study, fear specifically refers to individual fear of outbreaks and its driven behavioral responses during public health crises such as COVID-19 outbreaks. Such fear is particularly common, and individuals may feel deeply worried and anxious about the uncertainty of the future of the epidemic, resulting in a strong sense of anxiety. This emotional state not only affects their emotional and mental health, but also encourages them to constantly search for information to understand and control the threat of the epidemic. There is a complex interaction between information search behavior and fear: fear drives individuals to search for more

information, and negative or inaccurate information may in turn increase fear, creating a vicious circle. Therefore, a correct understanding of the performance of fear in the public health crisis and providing accurate information is particularly critical to alleviating fear, preventing the spread of rumors and promoting the overall mental health of society.

Based on the above analysis, the following assumptions are made:
H1. Online information search behavior can promote the fear of college students
H2. Offline information search behavior can promote the fear of college students

2.3 Rumor sharing

Rumors are information that is unverified or verified and is usually widely disseminated through oral communication, social media, or other informal channels. This information may be false, exaggerated or misleading and often influence the beliefs, attitudes or behaviors of the audience. The occurrence of rumors and the importance of events are directly proportional to the ambiguity. The more important and blurred the event is, the greater the effect of rumors is. In the modern environment, with the use of flexible and disorderly network transmission, the rumor dissemination becomes faster and more effective. Some rumors often change in the dissemination, which is on the one hand caused by the memory errors of the recipients and the communicators, and more importantly, individuals add their own subjective color intentionally or unintentionally in the process of dissemination. In addition, in the Chinese context, "rumor" has a derogatory meaning, which often refers to the rumors fabricated without the factual basis, groundless imagination or subjective will. The act of creating such rumors is called "rumor", and the act of spreading such rumors is called "rumor". Since the foundation of rumors is not based on facts, their authenticity is out of the question, and rumors are often revealed by real information. The generation and dissemination of rumors are influenced by many factors, including the group dynamics in social psychology, the way of media reporting, the development of information technology, and the social and cultural environment.

In this study, rumors specifically refers to rumor sharing behavior driven by fear during a public health crisis such as the COVID-19 outbreak. Studies suggests that fear is a strong emotional response, often triggered by a perceived threat or danger. When individuals are faced with COVID-19-related rumors, fear may affect how they process information, making them more vulnerable to incomplete or inaccurate information, which in turn prompts them to share these rumors on the Internet. Therefore, this study focuses on analyzing how fear emotion drives information search behavior, and in turn leads to the phenomenon of rumor spread, and explores the complex interaction between fear emotion, information search and rumor behavior. Accurately understanding this interaction and providing accurate information is critical to alleviating fear, preventing the spread of rumors and improving the overall mental health of society.

There is a strong link between rumor-sharing and fear, especially during public health crises such as the COVID-19 outbreak. Fear is a strong emotional response, often triggered by a perceived threat or danger. In the face of major events such as epidemics, their fear drives individuals to search for information for a sense of security and control. However, excessive information search, especially exposure to inaccurate or negative information, may aggravate fear. Fear also prompts individuals to share rumors to seek comfort and relieve anxiety. Rumors are often unconfirmed and lack reliable sources, but their rapid spread can affect public beliefs and behavior, exacerbating social unrest and panic. Therefore, understanding the relationship between rumor sharing and fear is of great significance to reduce the spread of rumors, improve the publics ability to identify information, and cope with social panic.

Based on the above analysis, the following assumptions are made:
H3. Fear can promote the rumor-sharing behavior of college students

2.4 Critical thinking

Under COVID-19, critical thinking is a critical cognitive process, involving the in-depth, comprehensive and rational analysis and evaluation of information, views, policies, and behaviors. This thinking mode is not only limited to simply accepting or rejecting information, but emphasizes the deep thinking and reflection of the problems faced through logical reasoning, objective evaluation and comprehensive judgment. During outbreaks, the application of critical thinking is particularly important because it helps individuals make informed decisions in a complex information environment. Specifically, critical thinking enables individuals to effectively screen, validate, and integrate information from different channels without being influenced by false information and misleading views. At the same time, critical thinking also promotes individuals to rationally evaluate policies and measures, and provide constructive feedback, so as to promote the improvement and optimization of policies. Furthermore, critical thinking encourages individuals to examine their own actions and social actions, ensuring individual decisions are rational and social responsibility.

During the online information search process, individuals may face the challenges of insufficient information credibility and excessive information quantity, which may promote the generation and spread of fear. When critical thinking is lacking, individuals are more vulnerable to being overwhelmed by unproven intelligence and confusing information influx, making it difficult to effectively analyze, screen, and evaluate them. This situation may increase the individuals sensitivity of exposure to misinformation and be more vulnerable to misleading and false messages, thus exacerbating their fear. In the face of huge amounts of information, the lack of rational and calm judgment will make individuals feel confused and insecure, further stimulating the fear caused by false information. Therefore, the information complexity and lack of effective evaluation means in online information search will have a negative impact on individual mental health and trigger the spread of fear.

On the other hand, offline information search includes obtaining information through face-to-face communication, reading print media or participating in physical meetings. Despite the problems of similar credibility and information overload, the information transmission in the offline environment presents different characteristics. In face-to-face communication, the direct transmission of emotions is more obvious, and non-verbal information such as personal expression, tone and body language may play a catalytic role in the spread of fear emotions. Although the information update speed of printed media is slow, its authority and system may give people more credibility. If it contains wrong information, it may have a more lasting impact on the formation of fear. Furthermore, in physical meetings or community events, group effects may amplify or weaken fear, depending on the overall attitudes of participants and how the information is presented. Therefore, although offline information search may seem to be more controllable, the lack of critical thinking may also lead to the aggravation and spread of fear, but its transmission route and mechanism of influence are different from the online environment.

Critical thinking plays a significant role in the offline information search process, especially in its positive regulation of fear emotion. In a non-virtual environment, individuals access information through traditional channels such as face-to-face communication, reading print media or attending physical meetings. These offline channels often emphasize the credibility and authority of information, enabling individuals to obtain verified information from authorities, professionals, or trusted media sources. Even so, however, the complexity and uncertainty of the information can still trigger individual fear.

Individuals with highly critical thinking are often able to assess the source and content of information more comprehensively and in depth. They have strong analytical, reasoning and judgment skills, able to identify potential biases and errors, thus reducing the fear caused by information uncertainty. Through rational analysis and empirical verification, individuals with high critical thinking can keep calm in the face of negative information and not be swayed by emotions, so as to avoid improper or overreaction due to fear. In addition, critical thinking can also enhance an individuals sense of control over information, so that it can be more comfortable in logical analysis and integration in the face of complex information, so as to reduce fear and improve mental health and decision-making quality. Therefore, critical thinking has a significant positive regulation effect on fear emotions in the offline information search, which is of great significance for individuals to rationally respond to the changes in the information environment.

Critical thinking can effectively regulate the role of fear on rumor sharing behavior, which is manifested in deepening the influence of fear in this process. When individuals have high critical thinking, they can evaluate the authenticity of information through logical reasoning and objective analysis when faced with a large amount of information. However, this in-depth analysis and evaluation process may also reveal more potential problems and risks, and thus further deepen the fear. For example, during the COVID-19 outbreak, critical-thinking

individuals are able to identify biases and deficiencies in the information, and this increased sensitivity to information uncertainty may lead to a stronger individual perception of the threat posed by the outbreak, thus increasing fear.

This fear, amplified by critical thinking, will further drive individuals to share more rumor information on the Internet to seek psychological comfort and social support. Although critical thinking should be able to suppress the spread of false information in theory, in practice, a high degree of critical thinking may lead individuals into excessive attention to negative information, thus inadvertently promoting the process of rumor dissemination. Therefore, critical thinking does not completely eliminate the driving effect of fear on rumor sharing, but also amplifies this effect to some extent, deepens the influence of fear on individual behavior, and makes the rumor sharing behavior more universal and extensive. Based on the above analysis, the following assumptions are made:

H4. Critical thinking will positively regulate (reinforce) the relationship between offline information search and fear.

H5. Critical thinking will positively regulate (reinforce) the relationship between online information search and fear.

H6. Critical thinking will positively mediate and (reinforce) the relationship between fear and rumor sharing.
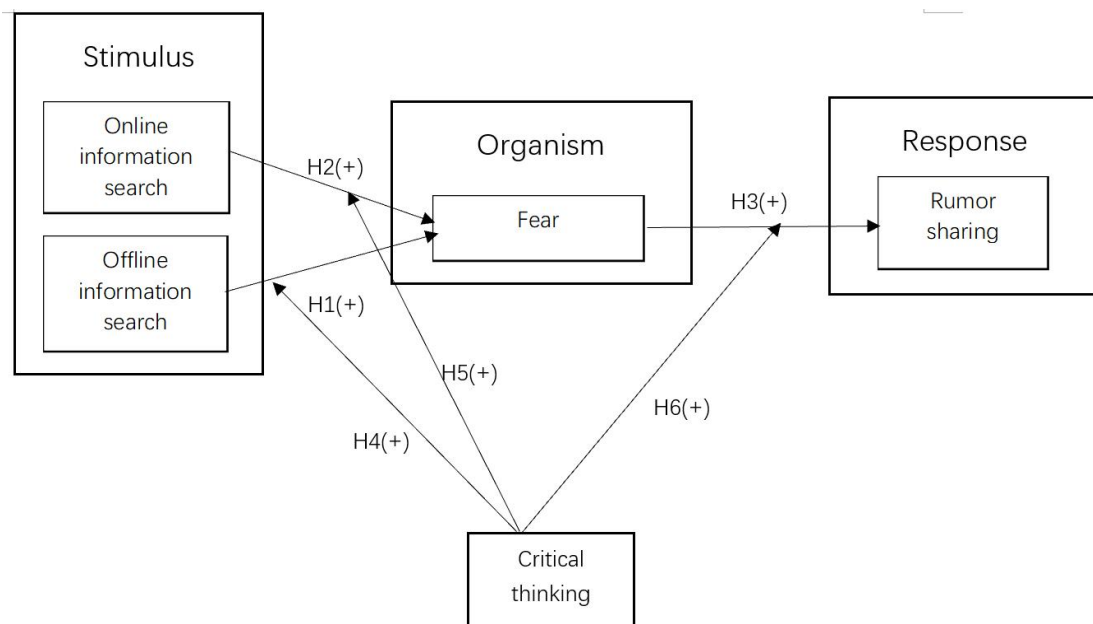
3. Research Technique

3.1 Data collection

In September 2023, as the COVID-19 epidemic stabilized, we realized that a large number of different rumors were circulating on social media, which triggered our interest in the public response to these rumors. In order to collect relevant data and understand public perception and attitude towards rumors, we decided to conduct an online survey.

We chose the online questionnaire platform Questionnaire Star (http://www.sojump.com/) in China as the survey tool, and adopted the random sampling technique. In order to maximize the coverage of different groups, we sent questionnaire links to users through wechat and website links. To encourage participation, we offered some items as a reward.

During the survey, we distributed a total of 1128 questionnaires and received 849 responses. After a preliminary analysis of the responses, we removed invalid answers, such as all the same or apparently contradictory answers. Ultimately, we received 720 valid responses, and these data were used for subsequent data analysis.

The demographic data of the analyzed sample showed that men accounted for 55.00% of the total number, 99.58% of respondents were under 30 years old, and 29.44% had a bachelors degree or above. These data provide us with a degree of representativeness and contribute to a better understanding of public attitudes and responses to rumors during the stable phase of the COVID-19 epidemic.

Table1 Sample demographics

Characteristics	Levels	Frequency	Percentage（%）
Gender	A.Male	396	55.00
	B.Female	324	45.00
Age group(AG)	A. < 18	67	9.31
	B.18~25	643	89.31
	C.26~30	7	.97
	D. > 30	3	.42
Education(ED)	A.Junior college	508	70.56
	B.Undergraduate	132	18.33
	C.Postgraduate	80	11.11
Living condition(LC)	A.living alone	5	0.7
	B.live with roommates	675	93.8
	C.live with family	38	5.3
	D.live with others	2	0.3

3.2 Measurement measures

Our questionnaire was divided into two parts: demographic information and study-related constructs. The first part collected the gender, age group, education and life status. The second part focuses on the measurement of various constructs, using a 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree), to ensure the accuracy and effectiveness of the questionnaire. To ensure consistency between the Chinese and English versions, we used dual translation / translation. In addition, we conducted a pilot study inviting 70 individuals to participate to improve the questionnaire content. All construct measures were adjusted based on previous literature to fit the current study context. After the English version of the questionnaire was compiled, we independently translated Chinese independently, and then the content of the questionnaire was reviewed and checked by a group of information system scholars to ensure the validity of its content. We collected information on gender, age group, educational background, occupation and residence conditions in the control variables.

3.2.1 Online information search

We used a three-item scale adapted from OhH. J. et al., (2013) to assess the participants tendency to search for virus-related information online. The scale measures their preference to use online social media platforms for obtaining such information. For example, one states: " During the epidemic, I often relied on social media platforms like Weibo for virus-related information."

3.2.2 Offline Information Search

To assess participants offline information search habits, some adjusted items from Suki and Suki (2019) were used. These items assessed how often participants discussed virus-related topics face to person with friends, roommates, and relatives in their daily lives and their preferences for accessing information through traditional media. Examples of the items used are as follows: " During the outbreak, I often had offline discussions with my friends, roommates, or relatives about the virus information."

3.2.3 Fear

To assess participants fear, the study adapted and modified some projects in 2015 by Boss et al. These adjusted items were primarily used to assess participants concern, fear, and anxiety about whether others would get the virus. Through these programs, researchers will be able to better understand the mental state and emotional reactions of participants in the face of viral infection. Examples of the items used are listed below: "I am afraid of being infected by someone else," "I am afraid of being infected by someone else," and "I am anxious about being infected by

someone else."

3.2.4 Rumor sharing

To assess rumor spreading behavior, several items of Venkatesh et al. (2003) were used. These items were used to measure whether participants spread virus-related rumors in social media or real life despite an inability to distinguish between true and false rumors. Use project examples as follows: "in the case of uncertain information authenticity, I share on weibo or WeChat virus related rumors", "in the case of uncertain information authenticity, I share with family and friends the rumors related to the virus", "in the case of uncertain information authenticity, I unconsciously share the rumors related to the virus"

3.2.5 Critical Thinking

The measure of critical thinking included three items adapted from et als study that assess the behavior of participants during the application of critical thinking. These programs specifically focus on the ability to analyze and evaluate information on social media. For example, one of them reads: " During the epidemic, when I share information on social media (Weibo / wechat, etc.), I will first critically analyze its authenticity and reliability.

3.2.6 Covariates

Covariates that may influence the dependent variables were considered in this study. Based on the results of a previous study (Luo et al., 2021; Ma et al., 2022), a series of demographic variables were included in the analytical model as control variables. These variables included age, gender, education level and living conditions, which were confirmed to have significant effects on individual cognitive processes and behavioral patterns.

4. Data Analysis

4.1 Measurement model

The results of the reliability and validity tests of the measurement model fully demonstrate the reliability and validity of the study tool. First, the composite relative reliability (CR) and Cronbachs α coefficients of all constructs were higher than 0.8, which indicates the internal consistency and stability of the structures and meets the reliability criteria proposed by Fornell and Larcker (1981). In addition, the factor load of most items is above 0.8, showing the close relationship between the individual measurement indicators and the concepts they represent,

further ensuring the reliability of the measurement tool.

Second, the extracted mean variance interpretation (AVE) value is greater than 0.6, which means that the variance explained by the measurement constructs is larger than the measurement error, showing good aggregate validity. The results of the discriminant validity further validate the validity of the measurement tool, and the square root of all AVE is larger than the correlation coefficient associated with other structures, indicating the uniqueness and differentiation of the measurement model.

Taken together, these results demonstrate the high quality and reliability of our measurement model in measurement indicator selection, data collection, and analysis methods. This not only provides strong data support for our study, but also enhances the credibility of the study results and lays a solid foundation for further analysis and research.

Scale properties						
	Items		Cronbach's alpha	CR	Factor loading	AVE
Rumor sharing	RS1		0.93	0.952	0.913	0.869
	RS2				0.956	
	RS3				0.927	
Offline information search	OF1		0.873	0.870	0.844	0.691
	OF2				0.812	
	OF3				0.837	
Online information search	ON1		0.858	0.869	0.857	0.689
	ON2				0.885	
	ON3				0.741	
Fear	FR1		0.883	0.906	0.879	0.763
	FR2				0.908	
	FR3				0.832	
Critical thinking	CT1		0.865	0.883	0.856	0.716
	CT2				0.867	
	CT3				0.814	

Correlations and discriminant validity

	AVE	Offline information search	Online information search	Fear	Rumor sharing	Critical thinking
Offline information search	0.691	**0.831**				
Online information search	0.689	0.592	**0.830**			
Fear	0.763	0.346	0.39	**0.874**		
Rumor sharing	0.869	0.117	0.020	0.093	**0.932**	
Critical thinking	0.716	0.502	0.363	0.404	0.152	**0.846**

4.2 Structural model

The coefficient was estimated in the regression model using SPSS and the results are presented in Table 4. First, in Model 1, both online and offline information searches showed a significant positive effect on fear (β = 0.255, p <0.001 and β = 0.145, p <0.001, respectively). This suggests that the level of fear felt by individuals increased with increasing online information search or offline information search after controlling for other factors. These results support that both H2 and H3. Then, in Model 5, there was a significant positive correlation between fear and rumor sharing (β = 0.148, p <0.005), indicating that fear significantly increased individuals online rumor sharing behavior, further supporting H1.

To further examine the role of critical thinking (H4, H5 and H6), we found that in model 3, the effect of critical thinking (CT) on online information search showed a significant positive regulatory effect (CT * ON: β =0.009, p <0.05), indicating that the higher the individual critical thinking, the greater the effect of online information search on fear. However, in Model 2, we failed to find an effect of moderate critical thinking between offline information search and fear (CT * OF: β = 0.005, p> 0.05) and, therefore, H5 was not supported. Finally, in Model 6, we found that enhancement of critical thinking could significantly enhance the effect of fear on rumor sharing behavior (CT * FR: β =0.027, p <0.001), indicating that fear of rumor sharing was significantly enhanced when individuals had higher critical thinking, supporting H6.

Estimation results

	FR				RS	
	Model 1 Coefficient(standard error)	Model 2 Coefficient(standard error)	Model 3 Coefficient(standard error)	Model 4 Coefficient(standard error)	Model 5 Coefficient(standard error)	Model 6 Coefficient(standard error)
OF	0.145*** (0.038)	0.064 (0.039)	0.063 (0.039)	0.064 (0.039)		
ON	0.255*** (0.042)	0.215*** (0.041)	0.213*** (0.041)	0.213*** (0.041)		
FR					0.148** (0.049)	0.078 (0.052)
CT		0.273*** (0.043)	0.265*** (0.043)	0.266*** (0.043)		0.123* (0.059)
Moderator						
CT*OF		0.005 (0.004)		-0.006 (0.007)		
CT*ON			0.009 *(0.004)	0.014 (0.008)		
CT*FR						0.027*** (0.006)
Constant	3.983*** (0.518)	3.016*** (0.525)	2.894*** (0.529)	2.878*** (0.529)	2.051** (0.728)	0.849 (0.756)
Control va	controlled	controlled	controlled	controlled	controlled	controlled
F	22.853	23.976	24.391	21.742	5.863	8.305
Adj-R²	0.154	0.204	0.207	0.206	0.033	0.066

5. Conclusion

5.1 Key Findings

This study used the S-O-R framework to deeply explore the motivation and process of COVID-19 rumor sharing on social media, and made some important findings.

First, studies have shown that online and offline information searches increase fear of COVID-19. This result further validates the stimulus-organism hypothesis. In other words, the more individuals proactively access the relevant information, both online and offline channels, the higher their fear level will be.

Second, the study found a positive correlation between fear and online rumor sharing, indicating that fear in COVID-19 prompted individuals to share rumors on social media to relieve their emotional stress. This finding reveals how fear emotion leads to irrational behavior in information transmission, which seeks emotional comfort by spreading inaccurate information.

Surprisingly, the research did not find that critical thinking enhances the impact of offline information search on COVID-19 fear. The possible explanation is that while critical thinking leads individuals to a deeper analysis of affective information during information acquisition, this process does not significantly amplify fear emotions. In offline information sources such as face-to-face communication and reading print media, because these information sources are more likely to contain emotional content that causes fear, critical thinking may have a weak regulatory effect. This suggests that critical thinking is not as effective as online information search.

Individuals with highly critical thinking usually have more analytical, reasoning and judgment skills during the online information search process, and they are able to evaluate the information obtained from the Internet more comprehensively and deeply. Nevertheless, in the face of a large number of negative emotions and information on the Internet, even individuals with high critical thinking may be affected by emotions, and it is difficult to remain completely calm and objective. Critical thinking enables them to identify potential biases and errors in network information, thus reducing the fear caused by information uncertainty and negative emotions.

Through logical analysis and empirical verification of online information, critical thinking helps individuals make more rational decisions in response to the epidemic and avoid inappropriate actions due to panic on the Internet. In an online environment, individuals are more exposed to disinformation and emotional manipulation, so the positive effects of critical thinking is particularly important. In conclusion, the positive regulation of the effect of information search on fear is significant.

Individuals with highly critical thinking usually have stronger analytical, reasoning and judgment skills in the process of offline information search, and they are able to more comprehensively and deeply evaluate the information obtained from offline channels. Nonetheless, even individuals with high critical thinking may be influenced by their emotions and struggle to remain calm and objective. Critical thinking allows them to identify potential biases and errors in information, thus reducing fear triggered by information uncertainty and negative emotions. Through logical analysis and empirical verification of information, critical thinking helps individuals to make more rational decisions in response to the epidemic and avoid improper actions due to blind fear. Therefore, critical thinking has a significant role in the positive regulation of fear on rumor-sharing behavior.

Critical thinking has a significant positive regulation between fear and rumor sharing, because individuals with high critical thinking are usually able to analyze, screen and evaluate information more effectively, thus reducing the impact of false information on their fear. Critical thinking enables individuals to keep rational and calm in the face of massive information, and to judge their reliability by verifying information sources and evaluating the logic and consistency of information content. This process of analysis and evaluation not only helps individuals to obtain

accurate information, but also enhances their sense of control over the information, thus reducing the fear caused by false information. Therefore, critical thinking plays a key regulatory role in the process of information search, helping individuals to effectively respond to the complexity of epidemic information, thus reducing the sharing of online rumors.

5.2 Theoretical Significance

First, based on the SOR theoretical framework and rational behavior theory, this study proposes a more comprehensive theoretical framework for understanding rumor refuting behavior and online rumor sharing behavior. This new model not only advances the existing SOR theoretical framework, but also makes important contributions to the rumor dissemination literature. Although the SOR theoretical framework is often used to explore individual behaviors in public health crises, such as rumor spreading and rumor refuting (Pal et al., 2020; Luo et al., 2021; Liu et al., 2023), previous studies have focused on the role of factors such as fear and trust in rumors in measuring individual behavior (Guo et al., 2023; Liu et al., 2023), rarely on college students. By combining the SOR theoretical framework with the theory of rational behavior, this study presents a new theoretical framework for online rumor refuting and rumor sharing behavior, which provides deeper insights into the dynamics of rumor sharing. The application of this framework enables us to better understand the relationship between stimuli, individual responses and external responses, so as to deeply explore the drivers and mechanisms of rumor dissemination and rumor refuting. Therefore, this study not only improves the theoretical framework of SOR, but also provides a more comprehensive understanding of online rumor-refuting and rumor-sharing behavior.

Secondly, this study revealed the regulatory role of critical thinking in the network behavior of college students. Critical thinking has important implications in shaping individual behavior, but its role in the spread of online rumors has not been fully studied. By exploring the impact of online and offline information search on critical thinking and further studying its regulatory role on COVID-19 fear and online rumor sharing, this study enriches our understanding of the process of online rumor spreading and deepens the relationship between critical thinking and online behavior. Critical thinking enables individuals to better analyze and evaluate the authenticity and reliability of information, thus reducing the possibility of rumor spreading. Furthermore, critical thinking can help individuals remain calm in the face of negative emotions and panic and make more rational decisions. This finding not only helps us to have a more comprehensive understanding of the mechanism of online rumor dissemination, but also provides theoretical support for the development of targeted interventions.

Finally, this study provides a comprehensive understanding of college students online rumor-sharing behavior during a public health crisis, enriching the existing rumor literature. We propose a new research method for rumor-sharing behavior from the perspective of information

acquisition. Previous research has mainly focused on the online rumor spreading mechanism, emphasizing social media and traditional media, while ignoring the importance of offline communication in obtaining information (Xu, 2020; Liu et al., 2023). In this study, we explored how online information search, offline information search, and fear emotions may influence rumor-sharing behavior. The results show that online information acquisition has a more significant impact on college students rumor-sharing attitudes than online information sources. Therefore, the emphasis on obtaining information from multiple channels simultaneously is crucial to fully understand and respond to rumor-sharing behavior.

5.3 Practical application

Using the S-O-R framework, this study deeply explores the motivation and process of rumor sharing about COVID-19 on social media, and makes some important findings. First, the positive association of online and offline information searches with fear of COVID-19 further validates the stimulus-organism hypothesis. In other words, as individuals have more fear of COVID-19, they prefer to actively access relevant information through a variety of channels, including online and offline channels. Second, research has pointed to a positive correlation between fear and online rumor sharing, suggesting that COVID-19 fear is a catalyst for individual sharing of rumors on social media to relieve their emotional stress. This finding reveals how fear leads to an irrational behavior in information transmission, namely spreading inaccurate information for emotional comfort. Moreover, critical thinking has found a positive regulation between individual fear of COVID-19 and rumor sharing.

The study found that critical thinking did not significantly alleviate fear of COVID-19. This may be because in offline information acquisition scenarios such as face-to-face communication and reading print media, individuals are more likely to receive emotional information, which is more likely to trigger fear, even if these individuals have highly critical thinking. This result suggests that the regulatory effect of critical thinking may not be as significant as in the online information search process. In order to effectively respond to this challenge, it is necessary to improve their critical thinking ability in offline information acquisition and enhance their ability to identify and evaluate information, thus reducing the impact of affective information on fear emotions. This finding reflects the possible differences in the role of critical thinking in different information acquisition settings and requires further research and exploration.

Critical thinking plays a key role in the process of information search online. When conducting information search, users should pay attention to the reliability and authority of information sources, and cross-verify the accuracy of information through multiple channels. Critical thinking helps users stay awake in an environment of information overload and avoid being influenced by false information and misleading opinions. In the process of information search, individuals should pay attention to logical reasoning and objective evaluation, and make comprehensive judgment and in-depth analysis of information through critical thinking. In order to support the

publics information search behavior, it is necessary to strengthen information transparency and improve the accuracy of information dissemination, and release comprehensive and accurate epidemic information in a timely manner through various channels. At the same time, information literacy education should be carried out to help the public master the basic skills and methods of critical thinking, improve the ability of information search and evaluation, so as to deal with the complexity of epidemic information, reduce the fear caused by false information, and ultimately reduce the spread of online rumors.

Critical thinking plays a significant role in the positive regulation between fear and rumor sharing. Individuals with highly critical thinking are able to analyze, screen, and evaluate information more effectively, reducing the impact of false information on their fear. Critical thinking enables individuals to keep rational and calm when facing the amount of massive information, and judge their reliability by verifying information sources and evaluating the logic and consistency of information content. This process of analysis and evaluation helps individuals to obtain accurate information and enhance their sense of control over the information, thus reducing the fear caused by false information. Therefore, critical thinking needs to be further promoted and popularized to enhance individuals ability to analyze and evaluate information and reduce the spread of rumors caused by fear.

6 Conclusions and limitations

6.1 Conclusion

This study used the S-O-R model to focus on exploring the rumor-sharing behavior on social media during COVID-19 (COVID-19). Using a sample of 720 social media users, this study confirms the relationship between information search behavior, fear, and rumor sharing. Studies have found that both online and offline information searches have exacerbated fear of COVID-19, testing the stimulus-organism hypothesis. At the same time, the study also found that fear was positively associated with online rumor-sharing behavior, indicating that individuals may relieve emotional stress by sharing rumors. These findings reveal complex interactive relationships between information acquisition, emotional responses, and information dissemination during a public health crisis. The results highlight the differentiating role of critical thinking in different contexts. In online information searches, critical thinking significantly modulates fear, helping individuals process information more rationally and reduce panic. However, the regulatory effect of critical thinking is not significant in offline information searches, probably because face-to-face communication and affective information in printed media are more likely to trigger fear, even for individuals with highly critical thinking. Nevertheless, critical thinking still shows a significant positive regulation between fear and rumor sharing, helping individuals to analyze and evaluate information more effectively and reducing their tendency to share false information. These findings highlight the importance of fostering and applying critical thinking in different information acquisition settings.

6.2 Future Outlook

This study used the S-O-R framework to deeply explore the motivation and process of rumor sharing about COVID-19 on social media, and made many important discoveries. First, we found a positive correlation between online and offline information searches and fear of COVID-19, further verifying the stimulus-organism hypothesis. As individuals increase their fear of COVID-19, they prefer to proactively obtain relevant information through various channels, including both online and offline channels. Second, research has pointed to a positive correlation between fear and online rumor sharing, suggesting that COVID-19 fear is a catalyst for individual sharing of rumors on social media to relieve their emotional stress. In addition, the study found that critical thinking had a regulatory role between individual fear of COVID-19 and rumor sharing, but critical thinking did not significantly reduce the effect of offline information search on COVID-19 fear, which may be related to the emotional tendency during offline information acquisition. Critical thinking has a significant positive regulation between fear and rumor sharing, indicating that individuals with high critical thinking are able to analyze, screen and evaluate information more effectively, thus reducing the impact of false information on their fear emotions. Therefore, critical thinking plays a key role in the process of online information search, helping individuals to effectively respond to the complexity of epidemic information.

Despite some progress in theoretical and practical applications of this study, some limitations remain to be considered. First, the survey data were based on samples in the context of a stable COVID-19 epidemic disease, so the generalizability of the findings was somewhat limited, especially in the context of other countries. Future studies could be conducted in different countries and in different contexts to verify the applicability of the results in a broader context. Second, the data sample is mainly composed of young people, which also limits the generalization ability of the study. Future studies could attempt to collect data from different age groups to obtain more comprehensive information. Moreover, although using critical thinking as a regulatory variable, this study did not fully consider other factors, such as rumor belief, social media use habits, and personal bias, which may affect individuals acceptance of online rumors and communication behavior. Therefore, in future studies, the role of these factors should be considered more comprehensively and explored for their relationship with critical thinking.

Further, future studies should not only focus on the psychological mechanism of rumor dissemination, but also deeply analyze the content characteristics and transmission path of rumors. Different types of rumor content and their transmission routes may have different effects on the transmission mechanisms and influencing factors, and a comprehensive understanding of these aspects will help to better cope with and manage the challenges of rumor dissemination. In conclusion, despite some progress in this study, further research is still needed to address these limitations and more fully understand the complexity of online rumor spreading.