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Fighting rumors to fight COVID-19: Investigating rumor belief and sharing on social media during the pandemic

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ARTICLE INFO

Keywords:

COVID-19 rumor
Social media
Traditional media
Rumor belief
Rumor sharing
Critical thinking

ABSTRACT

The outbreak of the coronavirus disease (COVID-19) pandemic, a significant health threat, influenced information-related behaviors and induced increased rumor-sharing behaviors on social media. Fighting COVID-19 thus entails the need to fight the rumors as well, providing a strong motivation to explore rumor-related behavior during this extraordinary period. From the perspective of information acquisition, we predicted that information acquisition from social and traditional media would interactively influence rumor-related decisions (i.e., rumor belief and sharing) and that critical thinking would shape this relationship. Through a survey of 2424 individuals who used social media during the pandemic, we found that information acquisition from social media was negatively related to rumor sharing and that rumor belief mediated this relationship. Meanwhile, information acquisition from traditional media weakened the negative effect of information acquisition from social media on rumor belief, and critical thinking alleviated the positive effect of rumor belief on rumor sharing. This study contributes to the literature by explaining the diffusion of COVID-19 rumors on social media from an information perspective and revealing how different information sources and thinking styles come into conflict in rumor decisions.

1. Introduction

The recent outbreak of the COVID-19 pandemic has threatened the health and well-being of millions of people around the globe (Abelsen et al., 2021; Pan & Zhang, 2020). Declared a global pandemic by the World Health Organization, COVID-19 had caused the deaths of more than two million people by January 16, 2021.¹ Undoubtedly, this pandemic has changed many aspects of people's lives, along with their behaviors related to information sharing, including how rumors are shared (Davison, 2020; Naeem & Ozuem, 2021; Tasnim et al., 2020). In fact, sharing rumors (meaning information and news without confirmation or certainty about facts) has the potential to negatively affect people's responses to this outbreak. For example, on January 31, 2020, information went viral on social media in China that *Shuanghuanglian*, a

traditional Chinese oral solution, could inhibit COVID-19, resulting in the stockout of related products and market confusion.² More seriously, misled by the rumor, some people got infected when scrambling for *Shuanghuanglian* in drugstores and some patients with COVID-19 took *Shuanghuanglian* blindly, resulting in aggravation of their health condition.³ Hence, given that rumor sharing on social media has been shown to significantly affecting lives, investigating the diffusion of rumors about COVID-19 or other contagions on social media is critical.

Because of the popularity of social media in modern society, many studies have focused on investigating the transmission of rumor-sharing on social media (Naeem & Ozuem, 2021; Pal et al., 2020). Some studies have applied a simulation approach to reveal the dynamic process of rumor sharing in this context. For instance, Zhao et al. (2013) applied the susceptible-infected-recovered (SIR) model to explore rumor

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¹ <https://news.un.org/en/story/2021/01/1082272>

² <http://news.cctv.com/2020/02/01/ARTIo2rU0u46kSwzMrxFYu0H200201.shtml>

³ <https://law.seu.edu.cn/2020/0330/c9375a322486/page.htm>

diffusion. Other studies have explored the reasons why people share rumors on social media (Pal et al., 2020). For example, Marett and Joshi (2009) found that the extrinsic and intrinsic motivations of online community users, as well as normative influences, affected their willingness to share rumors. Furthermore, in an investigation that focused on online rumor sharing in the context of the government's surveillance of the Internet, Kwon and Rao (2017) reported empirical results indicating that belief, anxiety, the threat situation, and concerns regarding the government's internet surveillance were closely related to citizens' willingness to engage in cyber-rumor sharing. However, most of the previous studies on rumor propagation methods have centered around rumor diffusion on social media and have paid little attention to the joint role of social media and traditional media. Nevertheless, both media types are complementary in terms of information access and rumor-related behaviors (Xu, 2020; Zhang et al., 2020). Thus, a combined investigation of information acquisition from social media and traditional media is important to understanding the rumor diffusion mechanism on social media.

Typically, social media and traditional media are the most-used sources of information for individuals, and social media dominates between the two kinds of media (Kim & Hawkins, 2020). As has long been argued, the proliferation of computers and mobile devices, accompanied by easy propagation of information, a very low access cost to online social media, and the gradual blurring of the boundary between media and audience make social media a hotbed of rumors (Varshney & Vishwakarma, 2020). At the same time, however, individuals can acquire abundant information from social media rumors, engage in real-time interactions, and verify and treat rumors cautiously, which will influence their belief in the rumor and rumor-sharing intentions (Li et al., 2021d; Varshney & Vishwakarma, 2020). Meanwhile, compared with other channels, traditional media is perceived as more authoritative and authentic, owing to the strong discourse, trustworthiness, and professionalism that have long characterized traditional media (Greer, 2004; Malka et al., 2009). Although falls short in real-time and interactivity and has occasionally released unverified information (e.g., the false news about *Shuanghuanglian* reported by Chinese traditional media during the epidemic⁴; pictures and videos of earthquake-stricken Haiti from Twitter users cited by traditional media as news sources in 2010), traditional media is still considered credible and has a complementary effect on social media (Ahsan et al., 2019; Malka et al., 2009). Hence, the information from these sources may interact with social media information to influence rumor belief. Furthermore, in the rumor decision-making process (i.e., about rumor belief and rumor sharing), critical thinking plays a key role in behavioral decision-making regarding which information resources to rely on, acting as a contingency effect (Polat et al., 2019). Thus, users who are characterized by different critical thinking levels may exhibit dissimilar decision processes regarding rumors, leading to varying behaviors. Consequently, this study aimed to investigate how rumors are transmitted on social media by exploring the following research questions (RQs):

RQ1: *How do social media and traditional media interact to determine rumor belief and rumor sharing?*

RQ2: *How does critical thinking shape rumor decisions?*

The literature on information acquisition has revealed that information flow concerning infectious diseases on social media is bidirectional and involves real-time interactions (Kim & Hawkins, 2020); individuals can verify information and exercise a cautious attitude about sharing it, thus reducing rumor sharing. Meanwhile, users who have access to abundant instant information from social media are less likely to believe rumors (Wang et al., 2018). Contrariwise, when they believe a rumor to be true, their motivation to share the rumor is particularly strong, and they are more likely to share it (Li & Sakamoto, 2014). Accordingly, rumor belief may mediate the effect on rumor sharing of

information acquisition from social media. In addition, individuals tend to consider information from traditional media publishers credible, perceiving it as more truthful than information from other sources (Li & Sakamoto, 2014). Thus, social media statements that are supported by information gained from traditional media are perceived to be more truthful and believable than unsupported information. In this way, information acquisition from traditional media weakens the negative effect of information acquisition from social media on rumor belief. Furthermore, in the rumor decision-making process (i.e., about rumor belief and rumor sharing), individuals who engage in critical thinking show open-mindedness and maturity, which enables them to judge the information and act cautiously (Dwyer et al., 2014). When such individuals acquire fake information from social media, they tend to adopt a more cautious attitude about believing the rumor. Moreover, even when they believe it, they are more likely to consider the damage resulting from sharing fake news on social media. In other words, critical thinking would enhance the negative effect of information acquisition from social media on rumor belief, while weaken the positive effect of rumor belief on rumor sharing.

This study drew upon the literature concerning rumor sharing, information acquisition, and critical thinking to develop a research model with five hypotheses. The hypotheses were then tested by a sample of 2424 social media users during the peak of the COVID-19 outbreak in China. This study contributes to the literature in several ways. First, the current study is among the first to distinguish between information acquisition from two channels (social media and traditional media) and empirically explore their interaction effects on rumor diffusion. Second, by identifying the underlying mediating mechanism of rumor belief, the study contributes to the knowledge base on the process of rumor sharing on social media. Third, the study adds to the understanding of the role of individuals' thinking in fighting rumors by introducing the concept of critical thinking regarding social media and revealing the contingency effects of critical thinking. Finally, this study provides an overall picture of the diffusion of COVID-19 rumors in the digital society of social media within the information science field. Our research findings also provide significant practical implications for social media users, platform managers, and policymakers.

2. Literature review

2.1. Rumor sharing

Rumor refers to a story or a statement that is generally circulating but lacks confirmation or certainty about facts (Naeem & Ozuem, 2021; Wang et al., 2018). Ever since individuals began exchanging information, rumors have become a common phenomenon. Driven by the popularity of social networks and major public health events, the spread of health rumors on social networks has become particularly noteworthy, attracting scholarly attention. In this regard, Table 1 presents a list of studies on rumor sharing.

The rumor-sharing literature has centered around exploring the driving and inhibiting factors affecting rumor sharing in order to propose strategies for controlling rumor propagation (Pal et al., 2020; Wang et al., 2018). However, in the current scenario, which features the widespread dissemination of rumors related to an unprecedented public health threat in the form of the ongoing COVID-19 pandemic, the research has not sufficiently examined how people share these rumors. Unlike earlier rumors on other topics, rumors about COVID-19 were generated and propagated rapidly on different information channels. Hence, in this study, we performed one of the first trials focused on user behavior related to rumors about COVID-19 and explored rumor diffusion from the view of information acquisition to obtain a more detailed, accurate explanation of human behaviors involved in disseminating COVID-19 rumors.

In addition, most rumor diffusion studies have confined their focus to rumor sharing on social media, paying little attention to offline

⁴ <https://law.seu.edu.cn/2020/0330/c9375a322486/page.htm>

Table 1
Studies about rumor sharing on social media.

Research aim	Research findings	Reference
Diffusion mechanism	The deterministic and stochastic models of rumor sharing were validated to control of rumor sharing on social networks.	Li et al. (2021b)
Diffusion mechanism	Subjective norm plays a pivotal role in shaping user behaviors regarding rumors and the emergence of different diffusion patterns.	Bodaghi and Oliveira (2020)
Diffusion mechanism	There are significant main effects and an interaction effect between argument volume and consistency on rumor belief and belief change.	Wang et al. (2018)
Rumor control	Personal involvement drives intentions to trust and share rumors.	Chua and Banerjee (2018)
Rumor control	A rumor refutation effectiveness index (REI) was developed, content factors and contextual factors influencing REI were identified, and decision-making suggestions for rumor refutation were proposed.	Li et al. (2021d)
Rumor control	The change of rumor-infected rate and probability of rumor disseminators transforms into positive public opinion disseminators, and the time of official statement for truth affects rumor propagation in varying degrees	Jiang et al. (2020)
Rumor control	Wise individuals among the public can curb rumor spreading.	Hu et al. (2018)

information channels—that is, traditional media. In contrast, we employed a comprehensive perspective to study the role of social media and traditional media in rumor diffusion, focusing on how they interact with each other, thus aiming to gain comprehensive knowledge of the effects of information acquisition on rumor belief and rumor-sharing behavior.

2.2. Information acquisition

Information acquisition refers to the process of obtaining information through certain technical means or methods for a certain purpose and within a certain scope (Agosto & Hughes-Hassell, 2005). The evaluation of the information obtained is influenced by its sources (Etingen et al., 2013). Oh et al. (2011) used situation awareness theory to study Twitter data related to three social crises—the 2008 terrorist attack in Mumbai, the 2010 recall of vehicles by Toyota Motors, and a shooting in 2012 at a cafe in Seattle—and found that the information source was the primary factor affecting rumor belief. In this regard, the media used for information acquisition and rumor spreading are also changing as information technology develops (Johnson & Kaye, 2016). The emergence of the Internet has changed people's information sources, expanding their choices from traditional media alone to a combination of traditional and social media (Chung, 2017). Therefore, studies on the means of information acquisition in an environment that promotes rumors are divided into two streams that feature the examination of either traditional or social media.

In the traditional media field, information is published and transmitted offline, and the audience is the receiver and consumer of the information (Chung, 2017; Xu, 2020). The boundary between media and the audience is clear. Nevertheless, the relevant literature has primarily studied the properties of traditional media and its role in the communication of information. Compared with information from other channels, the information obtained from traditional media is more likely to be trusted by the public owing to the strong discourse, trustworthiness, and professionalism that have long characterized traditional media (Greer, 2004; Malka et al., 2009).

However, in the context of social media, the audience does not passively receive information, different from the case with traditional media, and the gradual blurring of the boundary between media and

audience plays a vital role in information dissemination. Individuals who are confronted with unexpected events tend to experience increased feelings of tension. To release their tension, they may begin to try to make sense of the uncertain situation by collecting information. However, when faced with the inability to obtain timely information from formal sources, they move on to mobilize informal social networks (Garnett & Kouzmin, 2007). Thus, currently, social media is becoming an essential source of news and information; on a related note, few people access news only from traditional media (Chung, 2017; Xu, 2020). In this regard, the literature has focused on the complementarity of social and traditional media. For example, Zhang et al. (2020) found that both forms of media can be complementary in terms of information acquisition, which can alleviate the current information imbalance. The researchers went on to conclude that using traditional media offered an effective approach to dispelling rumors that have originated from social media. Nevertheless, the interplay between social and traditional media in rumor diffusion has remained underexplored.

Despite the richness of rumor literature, most of the previous studies mainly focus on rumor diffusion on social media without a better understanding of the interplay between different information accesses. In fact, since the most common sources of COVID-19-related information are Internet media and traditional media (Ho et al., 2020), a combined investigation of information acquisition from social media and traditional media is important to understanding the rumor diffusion mechanism during such pandemics. Given the potential of rumor behavior to negatively affect people's responses to the outbreak of the pandemic, sufficient insight into the joint role of social media and traditional media in shaping rumor-related behaviors is needed. To narrow the research gap, we focus on the interplay between traditional media and social media in the rumor context by empirically exploring the effect of information acquisition sources on rumor belief and rumor sharing.

2.3. Critical thinking

Critical thinking refers to the element of media literacy that requires the recognition that there are certain subjective assumptions underlying belief (Feuerstein, 1999). In other words, critical thinking allows an individual to recognize any information or rationale offered as limited by the perspective and/or motivations of its sender and thus to disentangle facts from rumors and inactivate false information (Feuerstein, 1999; McPeck, 2016). Critical thinking studies have typically focused on one of two aspects. Regarding the first aspect, some studies have sought to explain the role of critical thinking in the rumor context. For example, critical thinking is considered essential in eliminating rumors at the source and also the basic mechanism to prevent rumors (Kitamura, 2013). In addition, critical thinking has also been found to affect the existing self-purification mechanism of social media (Zhang et al., 2021b). The second aspect entails approaching the topic from the perspective of exploring ways to improve the public's capacity for critical thinking. For example, Tanaka et al. (2013) asserted that society might be able to curb rumor issues by creating a mechanism to influence people by employing criticisms of the information coming from others.

The literature has also explored the effects of critical thinking on behavioral decision-making while concentrating mainly on the medical field. For example, some studies have found no correlation between critical thinking and behavioral decisions (Hoffman & Elwin, 2004). Other studies reported that nurses with higher critical thinking scores were more indecisive in decision-making related to their tasks (Polat et al., 2019). Thus, these studies have uncovered inconsistencies in the role of critical thinking in human behavior, with the result that the effects of critical thinking on behavioral decision-making remain ambiguous and need further investigation. More importantly, outside of the medical field, few scholars have explored its contingency role, such as the influence of human decisions in the rumor context. Accordingly, we have linked critical thinking with decision-making concerning rumor sharing in the detailed discussion of the factors that influence rumor

sharing.

Some studies have conducted a preliminary exploration of the role of critical thinking in rumor diffusion. For example, it has been demonstrated that critical thinking should be a key part of information literacy education in the spreading of urban legends (Ardell, 2004). Amaral et al. (2020) replaced critical thinking with beneficial traits to develop a rumor propagation model through physical formulas. Nevertheless, the foregoing discussion supports the conclusion that the research on the influence of critical thinking on information behavior decisions remains ambiguous, urging an investigation into the significant contingent role of critical thinking in rumor-sharing decisions.

3. Research model

In this study, we focus on fighting rumors to fight COVID-19 and investigate how information acquisition from social media (IASM) and information acquisition from traditional media (IATM) interactively affect rumor belief (RB) and rumor sharing (RS) by considering the contingency effect of critical thinking (CT). The research model is presented in Fig. 1.

3.1. Information acquisition from social media and rumor sharing

During outbreaks of infectious diseases, people attempt to obtain relevant information through various channels, especially social media and traditional media, as their demand for information increases (Kim & Hawkins, 2020). In many cases, some people post relevant information that may not represent the truth out of the motivation to become early responders to events or information disseminators. Others use the information to fill information gaps and share this information with their relatives and communities for altruistic and anxiety-relief purposes (Ahsan et al., 2019). Once it is available on open platforms, the information may be shared openly and disseminated widely without restrictions or even without verification and confirmation (Pathak et al., 2020).

As an important channel for sharing individual opinions, social media facilitates rapid and easy propagation of information, imposing a very low access cost owing to the proliferation of smartphones and other mobile devices (Li et al., 2021d; Varshney & Vishwakarma, 2020). Thus, online social media has become a predominant channel for information acquisition. Although many researchers have criticized social media for accelerating the spread of rumors, this information resource can still be helpful in rumor control (Wang & Zhuang, 2018). As identified by previous studies, social media has a self-correction function that can be explained by broad mass participation and the persistent discussions that are inherent to social media (Castillo et al., 2013; Wang & Zhuang, 2018). Specifically, social media has several distinct characteristics that differentiate it from traditional media and lead to its eventual influence over user behavior.

First, the information flow in social media is bidirectional rather than unidirectional, meaning that social media users can interact with the information publisher and other users who are accessing the information (Kim & Hawkins, 2020). These characteristics allow individuals who acquire information about infectious diseases from social media to verify its accuracy and avoid rumor sharing. Second, the nature of social media facilitates the easy replication and dissemination of information; as a result, individuals often receive numerous pieces of information from multiple sources (Kim & Hawkins, 2020). Notably, the information provided by knowledgeable users who can identify and correct rumors will also be part of the communication spreading on social media (Wang et al., 2018; Wang & Zhuang, 2018). Thus, users are able to identify whether the information is true or not by comparing the information from different sources, a practice that hinders the rumor-sharing process. Third, the understanding of social media has changed as its popularity has grown. Nowadays, individuals have become increasingly aware that social media platforms are sources of entertaining, virtual,

and casual information rather than dedicated information-publishing platforms (Zhu & Wang, 2020). If “professional information” from social media platforms that they shared is actually false and misleading, they would cause detriment to the community and suffer loss in their own status building and reputation capital (Marett & Joshi, 2009). Thus, they might be more cautious and less willing to share information related to a professional field without verification.

Overall, because of the abundant sources and extensive real-time interactions regarding information, information acquisition from social media will lead to opportunities for verification and treatment with more cautiousness, thus reducing rumor sharing. Based on these arguments, we proposed the following hypothesis:

H1: *Information acquisition from social media is negatively related to rumor sharing.*

3.2. Mediating effects of rumor belief

The platform characteristics of media synchronization and richness of expression affect the possibility that information receivers will believe in false rumors (Oh et al., 2018). A prominent characteristic of social media platforms is that they display the views of numerous other users. Therefore, users are exposed to rumors along with a substantial amount of supplementary information, including questions regarding those rumors and the popular science of related knowledge (Wang et al., 2018). Access to abundant instant information makes users less likely to believe rumors unquestioningly. In addition, unlike traditional media, such as radio and television, social media platforms are often considered life-oriented, virtual, and entertaining rather than professional and authoritative (Zhu & Wang, 2020). Therefore, users may not easily believe social media rumors about a specialized topic, such as an epidemic situation. In other words, information acquisition from social media may reduce the likelihood of rumor belief.

Rumor belief also impacts rumor sharing. Personal anxiety, general uncertainty, credulity (i.e., plausibility), and topical importance are significant antecedents of rumor sharing (Marett & Joshi, 2009; Rosnow, 1988). Furthermore, individuals who believe rumors to be true are more likely to engage in rumor sharing, especially during a period of societal anxiety, such as an epidemic outbreak (Wang et al., 2018). In addition, rumor sharing and information sharing bear certain similarities, of which one is that both are voluntary rather than compulsory. A key reason that individuals share the information they acquire from various media is to contribute to the community or benefit others. Thus, through their sharing behavior, they achieve a sense of reciprocity (Marett & Joshi, 2009). When individuals perceive the rumor as true, their motivation to share is particularly strong, and they are more likely to share it (Li & Sakamoto, 2014). Moreover, rumor sharing may be driven by individuals' attempts to boost their status and accumulate reputational capital in their social network, particularly when they believe that rumors are indeed correct (Jeppesen & Frederiksen, 2006; Marett & Joshi, 2009). Thus, rumor belief leads to rumor sharing. In other words, the lower the level of belief in the veracity of a rumor, the lower will be the likelihood that the rumor will be shared.

In summary, information acquisition from social media leads to a decrease in rumor belief, which then leads to a decrease in rumor sharing. Therefore, we proposed the following hypothesis:

H2: *Rumor belief mediates the relationship between information acquisition from social media and rumor sharing.*

3.3. Moderating effects of information acquisition from traditional media

Unexpected extreme events can cause people to grow tense. In order to alleviate their tension, they turn to traditional media in search of trustworthy, relevant information (Ahsan et al., 2019). As studied by (Ho et al., 2020), the most common sources of COVID-19-related information were Internet media and traditional media; furthermore, 52.62% of the participants reported using the latter. Worth mentioning

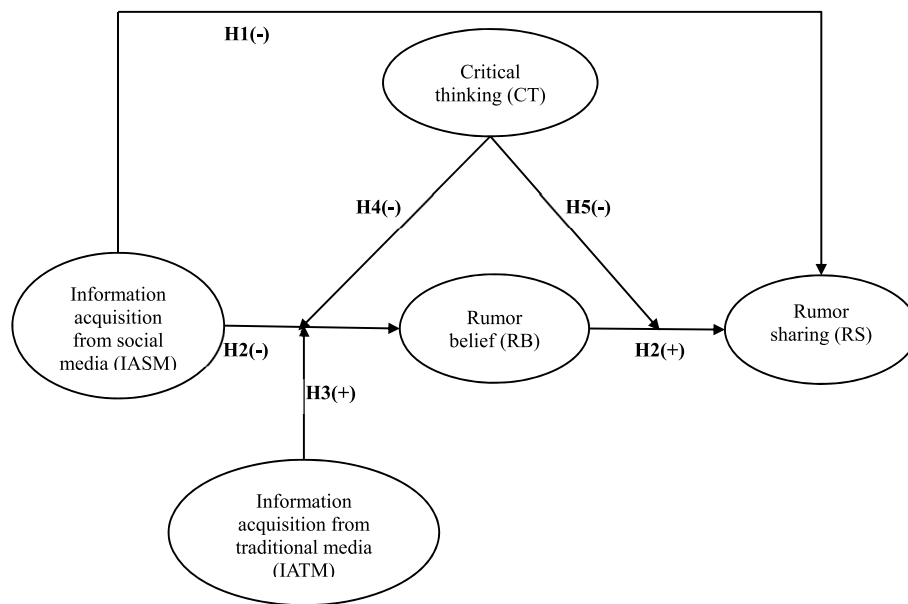


Fig. 1. Research model.

is that traditional media draw from and acknowledge real-time reporting found on social media and will cite social media as their source of information in many cases (Ahsan et al., 2019). For example, in 2010, as early as a few moments into the emergency, Twitter users shared pictures and videos of earthquake-stricken Haiti, which traditional media cited as their news source (Ahsan et al., 2019). Moreover, during the outbreak of COVID-19, there is indeed some unverified information released on traditional media in China⁵.

The different modes that individuals use to acquire information may lead to different beliefs, attitudes, and behavioral intentions (Fishbein & Cappella, 2006; Kim & Hawkins, 2020). Traditional media, which include newspapers, television, and radio, have served as individuals' main sources of official information since their advent. In contrast to the emerging online social media, the information publishers of traditional media are considered authentic organizations and individuals. Credibility is related to truthfulness in that more credible information is perceived as more truthful (Li & Sakamoto, 2014). Therefore, statements on social media that are supported by information from traditional media are perceived as more truthful and believable (Li & Sakamoto, 2014). In other words, information acquisition from traditional media moderates the effect of information acquisition from social media and rumor belief.

Social media platforms offer real-time interaction, whereas traditional media are channels with certain authenticity and authority (Zhang et al., 2020). When information is acquired from both traditional media and social media and information from the former verifies information from the latter, the probability that individuals will believe the rumor greatly increases. Thus, the support of information acquisition from traditional media weakens doubts regarding the authenticity and credibility of social media information disseminators. Conversely, information acquisition from traditional media allows individuals to ignore questionable perspectives on social media platforms since traditional media are usually deemed more authoritative and credible. Thus, although information acquisition from social media leads to a lower likelihood of rumor belief, the likelihood increases when the information matches that obtained through traditional media. That is, traditional media weaken the negative relationship between information acquisition from social media and rumor belief. Based on these

arguments, we proposed the following hypothesis:

H3. *Information acquisition from traditional media weakens the negative relationship between information acquisition from social media and rumor belief.*

3.4. Moderating effects of critical thinking

Critical thinking is the higher-order thinking focused on evaluating and deciding what to believe or do (Filippou et al., 2016; Howard et al., 2015). Critical thinking comprises a broad framework that includes cognitive skills (e.g., analysis, evaluation, inference, and reflective judgment) and specific dispositions (e.g., truth-seeking, open-mindedness, systematicity, inquisitiveness, and maturity) (Akpur, 2020; Mishra et al., 2017; Ren et al., 2020). It allows individuals to find facts among rumors and inactivate false information, and such abilities are essential when social media is flooded with rumors during a disaster response (Tanaka et al., 2013). Individuals with higher critical thinking tend to process information in a more rational way, such as by seeking out new information, instead of mainly through the intuitive-experiential system, particularly concerning information from informal sources, including media (Bensley et al., 2014). Thus, critical thinking is also a significant factor of individuals in preventing the spread of rumors (Amaral et al., 2020), which may moderate rumor decisions on social media.

Individuals with critical thinking are less likely to believe rumors received from social media for two main reasons. First, such individuals are more inquisitive and truth-seeking (Ren et al., 2020). Accordingly, they have a more skeptical attitude toward information acquired from various channels. When they receive information in the form of rumors on social media, they will actively search for judgments and feedback on this information from others' comments and other content available on the platform. They may also turn to other platforms and channels to obtain additional information and knowledge. Consequently, they are more likely to identify false information in rumors via active search and verification. Taken together, these behaviors indicate that the likelihood of rumor belief in information acquisition from social media is lower among individuals with critical thinking.

Second, individuals with high critical thinking have a better command of such cognitive skills as analysis, evaluation, and inference than their counterparts whose critical thinking is low (Ren et al., 2020). The former group goes beyond simply retaining information in their aim to

⁵ <https://law.seu.edu.cn/2020/0330/c9375a322486/page.htm>

gain a complex comprehension of incoming information in order to reasonably determine what they ought to believe or do (Halpern, 2014; Li et al., 2021c). As for the information that they acquire from social media, they attempt to gain insight into the logic behind the content to better identify facts and fake news and reduce rumor belief. In sum, because of these thinking skills and specific dispositions, individuals with higher critical thinking are less likely to believe rumors following information acquisition from social media. Accordingly, we proposed the following hypothesis:

H4: Critical thinking strengthens the negative relationship between information acquisition from social media and rumor belief.

Similarly, individuals with higher critical thinking show a higher level of open-mindedness and maturity, which enables them to judge and act cautiously (Dwyer et al., 2014). As a subskill of critical thinking, reflective judgment involves individuals' ability to acknowledge that their views might be falsified by additional evidence obtained later (Howard et al., 2015). Consequently, individuals with higher critical thinking are more likely to recognize the limitations of their thinking and cognition without biasing their own judgments. Even if they possess a certain belief or opinion, they will consider the opposite or a different situation. Despite a belief in rumors, individuals with higher critical thinking may tend to take into account their lack of personal knowledge and hold a relatively rational and conservative attitude toward their own judgments. They are more prone to think about the harm that is likely to be caused by sharing fake news in their community, along with considering the damage to their reputational capital in social networks from such actions. This trait means that even with rumor belief, these individuals are less inclined to engage in rumor sharing. Based on this discussion, we propose the following hypothesis:

H5: Critical thinking weakens the positive relationship between rumor belief and rumor sharing.

4. Research method

4.1. Data collection

To test the proposed hypotheses, we conducted an online survey to collect data in February 2020, a time frame when the COVID-19 pandemic was very serious in China, and many different rumors were being spread on social media. This online survey drew upon the large sample pool provided by SOJUMP (<http://www.sojump.com/>) in China, as reported in previous studies (Li et al., 2021a; Sun et al., 2017). Mainly adopting the snowball sampling technique, we distributed the link via referrals on WeChat to direct the users to the questionnaire. A small amount of money (CNY 2–5) was provided to each respondent to encourage participation. We distributed 4000 questionnaires and received 2986 responses. We deleted some invalid questionnaires in which all answers were the same, some answers were missing, or some answers were obviously contradictory. Finally, we secured 2424 valid responses for data analysis.

The measurements for most constructs were adapted from previous studies (see Appendix A in English and Appendix B in Chinese). The items for rumor sharing were adapted from Venkatesh et al. (2003) and Zhang et al. (2021a). Following the method of Kwon and Rao (2017), rumor belief (RB) was measured using eight online rumors about COVID-19, and the participants were asked about the extent to which they believed four of the rumors that were randomly assigned by the system. The items for information acquisition from social media (IASM) and information acquisition from traditional media (IATM) were adapted from Oh et al. (2013). The items for critical thinking (CT) were adapted from Littlejohn et al. (2016) and Reparaz et al. (2020) and were validated by Fontana et al. (2015). A sub-scale, in lieu of more comprehensive measures of CT such as the Watson Glaser Critical Thinking Appraisal (Hassan & Madhum, 2007), was chosen to keep the online questionnaire short and, therefore, guarantee an acceptable response rate (Berdie, 1973; Phellas et al., 2011).

We used a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Initially, we developed the English language version of the questionnaire, then translated it into Chinese independently to ensure that no differences existed between the two versions of constructs. Next, we asked a group of Information Science scholars to review and check the questionnaire content validity before administering it. Lastly, we collected and controlled for the respondents' demographic information, including gender, age, educational background (junior college, undergraduate, and postgraduate), section (country, suburb, and others) and family type (lived with children or not), and asked them to indicate whether or not they resided in Hubei.

4.2. Data analysis and results

Before conducting the regression analysis, we tested the reliability and validity of the constructs with the software of AMOS. Accordingly, we used confirmatory factor analysis to evaluate construct validity, according to Marsh et al. (2004), whereupon a reasonable model fit to the data was presented ($\chi^2/df = 2.649$; GFI = 0.990, TLI = 0.985; RMSEA = 0.056; SRMR = 0.033). All items' factor loadings were larger than 0.6 in relevant factors; we also confirmed that there were no high cross-loadings by applying Promax rotation (Carpenter, 2018); therefore, the convergent validity was good (Fornell & Larcker, 1981; Nerur et al., 2008). As Table 2 shows, the values of Cronbach's alpha, average variances extracted (AVE), and composite reliability (CR) of all constructs exceeded 0.7, and thus, the construct reliability was good (Zhang et al., 2017). Table 3 displays the means, standard deviations, correlations, and square roots of AVE scores for the main variables. The results indicate that all the square roots of AVE (0.851–0.918) were larger than the correlation coefficients among the main variables (maximum value was 0.433), which demonstrated good discriminant validity (Abelsen et al., 2021; Fornell & Larcker, 1981).

Following the suggestion of (Podsakoff et al., 2003, 2012), we applied two methods to detect common method bias. First, we conducted Harman's single-factor test. The results showed that the first factor only accounted for 37.062% of the total variance (less than the 50% threshold); thus, common method bias was not a serious problem in this investigation. Second, common method bias was further detected by all items being modeled to measure a single factor. The results indicated that the model fit was worse than the base model ($\chi^2/df = 5.145$; CFI = 0.576, TLI = 0.434; RMSEA = 0.310; SRMR = 0.193). In other words, common method bias was not obvious in this study.

We tested our hypotheses using the regression method with the software of STATA, a widely applied technique that is used to test moderating and mediating effects (Bartel et al., 2012; Cohen et al., 2003; Guo et al., 2020). For the multi-item variables, we used the average of respondents' ratings of the relevant items. The values of variance inflation factors (VIFs) in all regressions are between 1.013 and 1.390, far below the threshold of 10 (Khurana et al., 2019). The regression results can be found in Table 4.

To test for mediating effects, we applied three-stage mediated regression in line with (Baron & Kenny, 1986). In the first stage (Model

Table 2
Reliability of constructs.

Construct	Item	Factor loading	Cronbach's alpha	CR	AVE
Rumor sharing (RS)	RS1	0.906	0.942	0.942	0.843
	RS2	0.931			
	RS3	0.918			
Information acquisition from social media (IASM)	IASM1	0.903	0.838	0.905	0.761
	IASM1	0.908			
	IASM1	0.801			
Critical thinking (CT)	CT1	0.860	0.853	0.887	0.724
	CT2	0.861			
	CT3	0.832			

Table 3
Descriptive statistics and discriminant validity.

	RS	RB	IASM	IATM	CT	Gender
RS	0.918					
RB	0.324***	–				
IASM	–0.050*	–0.099***	0.872			
IATM	–0.009	–0.043*	0.433***	–		
CT	–0.464***	–0.227***	–0.111***	–0.126***	0.851	
Gender	–0.098***	0.034	0.049*	–0.009	0.062**	–
Age	0.014	–0.001	–0.007	0.064**	0.015	0.024
Education	–0.059**	–0.066**	0.104***	–0.120***	0.083***	0.052*
Hubei	0.005	–0.020	–0.020	–0.021	–0.037	0.015
Section1	0.016	0.042*	–0.018	–0.005	–0.055**	–0.051*
Section2	0.020	0.035	–0.009	–0.002	–0.012	0.025
Family type	0.018	0.062**	0.054**	0.029	–0.040*	0.041*
Mean	2.173	17.901	4.042	3.784	3.204	1.502
Standard Deviation	1.157	19.474	0.808	1.135	1.037	0.500
Age	–	Education	Hubei	Section2	Section3	Family type
Age	–					
Education	–0.045*	–				
Hubei	–0.086***	0.048*	–			
Section1	–0.193***	–0.137***	0.037	–		
Section2	–0.003	–0.025	–0.020	–0.230***	–	
Family type	0.172***	–0.023	–0.028	–0.054**	0.006	–
Mean	3.024	3.704	0.033	0.304	0.108	0.181
Standard Deviation	1.256	1.044	0.180	0.460	0.311	0.385

Note: * $p < 0.050$, ** $p < 0.010$, *** $p < 0.001$; RS: rumor sharing; RB: rumor belief; IASM: information acquisition from social media; IATM: information acquisition from traditional media; CT: critical thinking.

Table 4
Regression results (N = 2424).

Independent variable	RS	RB	RS	RB	RB	RS	RB
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
IASM	–0.094***	–0.111***	–0.069***	–0.100***	–0.116*	–0.075***	–0.107***
RB			0.220***			0.196***	
IASM × IATM				0.044*			0.053*
IASM × CT					0.021		0.035
RB × CT						–0.084***	
IATM	–0.013	–0.030	–0.006	–0.035	–0.028	–0.013	–0.033
CT	–0.472***	–0.236***	–0.420***	–0.236***	–0.243***	–0.419***	–0.247***
Gender	–0.065***	–0.014	–0.062***	–0.012	–0.013	–0.062***	–0.011
Age	0.019	–0.003	0.020	–0.001	–0.004	0.018	–0.002
Education	–0.008	–0.030	–0.002	–0.028	–0.029	–0.004	–0.026
Hubei	–0.011	–0.029	–0.004	–0.028	–0.029	–0.002	–0.028
Section1	–0.009	0.035	–0.017	0.033	0.033	–0.017	0.031
Section2	0.013	0.038	–0.004	0.037	0.038	–0.003	0.038
Family type	0.003	0.061**	–0.010	0.061**	0.061**	–0.011	0.062**
F	72.299***	19.700***	83.326***	18.377***	17.996***	78.827***	17.068***
R ²	0.231	0.075	0.275	0.077	0.076	0.282	0.078
Adjust R ²	0.227	0.072	0.272	0.073	0.072	0.278	0.074

Note: * $p < 0.050$, ** $p < 0.010$, *** $p < 0.001$; the coefficients are standardized coefficients; Gender is dummy-coded (male = 1, female = 0); RS: rumor sharing; RB: rumor belief; IASM: information acquisition from social media; IATM: information acquisition from traditional media; CT: critical thinking.

1), we regressed information acquisition from social media on rumor sharing and found the equation was significant ($F = 72.299$, $p < 0.001$). Information acquisition from social media was negatively and significantly related to rumor sharing ($\beta = -0.094$, $p < 0.001$). Thus, H1 was supported. In the second stage (Model 2), we regressed information acquisition from social media on rumor belief and discovered that information acquisition from social media was negatively and significantly related to rumor belief ($\beta = -0.111$, $p < 0.001$). In the final stage (Model 3), on regressing information acquisition from social media simultaneously with rumor belief, the coefficient of rumor belief ($\beta = 0.220$, $p < 0.001$) was positive and significant, and the coefficient of information acquisition from social media ($\beta = -0.069$, $p < 0.001$) was also significant. In other words, our findings indicated that rumor belief partially mediates the relationship between information acquisition from social media and rumor sharing. Thus, H2 was supported.

To test moderating effects, we applied a hierarchical multiple regression method in line with prior studies (Cohen et al., 2003; Guo

et al., 2020). Following the procedure suggested by Cohen et al. (2003), we incorporated in Model 4 and the interaction term (IASM × IATM) based on Model 2. The results indicated that the coefficient of interaction term was positive and significant ($\beta = 0.044$, $p < 0.050$). Following the suggestions of Johnson and Neyman (1936) and Spiller et al. (2013), we plotted the marginal effect of information acquisition from social media on rumor belief at different levels of information acquisition from traditional media (see Fig. 2). We found that as the value of information acquisition from traditional media increased from 1 to 4.328 (accounting for 68.853% of the total sample size), the negative effect of information acquisition from social media on rumor belief became significantly weaker. Thus, H3 was supported. In Model 5, after entering the interaction term (IASM × CT) on the basis of Model 2, the coefficient of the interaction term was insignificant ($\beta = 0.021$, $p > 0.050$). Therefore, H4 was not supported.

In Model 6, after entering the interaction term (RB × CT) based on Model 3, the coefficient of the interaction term was negative and

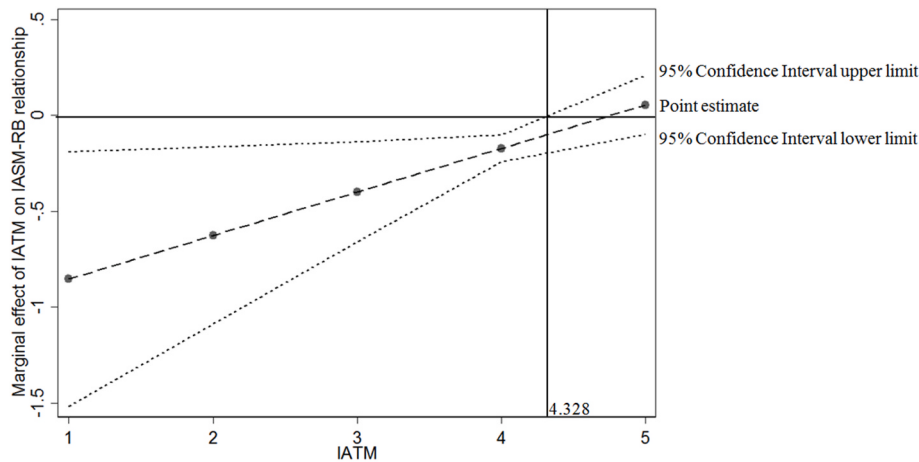


Fig. 2. Moderating effect of information acquisition from traditional media (IATM) on the relationship between information acquisition from social media (IASM) and rumor belief (RB).

significant ($\beta = -0.084, p < 0.001$). We also plotted the marginal effect of rumor belief on rumor sharing at different levels of critical thinking (see Fig. 3). According to Fig. 3, as the value of critical thinking increased from 1 to 4.862 (accounting for 92.203% of the total sample size), the positive impact of rumor belief on rumor sharing became significantly weaker. Thus, H5 was supported.

4.3. Supplementary analyses

To test the robustness of our regression results, following the suggestions of Yang et al. (2015) and Guo et al. (2020), in the regression on rumor belief, we included the control variables, information acquisition from social media (IASM), information acquisition from traditional media (IATM), critical thinking (CT), $IASM \times IATM$, and $IASM \times CT$, in the full model (see Model 7 in Table 4). The results indicated that the coefficient of $IASM \times IATM$ was positive and significant ($\beta = 0.053, p < 0.050$), while the coefficient of $IASM \times CT$ was not significant ($\beta = 0.035, p > 0.050$), which was consistent with the results of Model 4 and Model 5 in Table 4. Therefore, we found additional support for the interaction hypothesis (H3).

To further test the robustness of the moderated mediation model, we applied the PROCESS macro technique recommended by prior studies (Hayes, 2013; Jiang, 2017; Tolentino et al., 2014) to test the model. Specifically, we adopted Model 4 and Model 60 in the PROCESS macro to test the mediation effects and the moderated mediation effects. The Model 4 results indicated that the direct effect of information acquisition

from social media on rumor sharing was significant (*direct effect* = $-0.099, p < 0.001$, 95% CI = $[-0.155, -0.044]$), and the indirect effect was significant (*indirect effect* = $-0.035, p < 0.001$, 95% CI = $[-0.051, -0.020]$). Thus, the mediated effect was identified, and H2 was further supported. The results in Model 60 demonstrated that the coefficients of the interaction items ($IASM \times IATM$ and $RB \times CT$) were 0.918 ($p < 0.050$, 95% CI = $[0.207, 1.628]$) and -0.004 ($p < 0.001$, 95% CI = $[-0.006, -0.003]$). Therefore, both moderated effects were uncovered, and H3 and H5 were further supported. The coefficient of the interaction term ($IASM \times CT$) was 0.727 ($p > 0.050$, 95% CI = $[-0.168, 1.622]$), which was insignificant. Thus, H4 was not supported. Following the suggestions of Hayes (2015) and Farooq et al. (2017), we also provide here the index of moderated mediation at low, moderate, and high on the moderators (e.g., the mean as well as a standard deviation below and above the mean) in Table 5. The results of the PROCESS macro were almost identical to the regression results; hence, the results are robust.

5. Discussion

5.1. Key findings

Social media plays an important role in disseminating health communication widely and can offer accessible, timely responses to health concerns, specifically during emergencies (Kim & Hawkins, 2020). However, characterized by the rapid spread of content, online social media can become a stepping stone to rumor sharing and

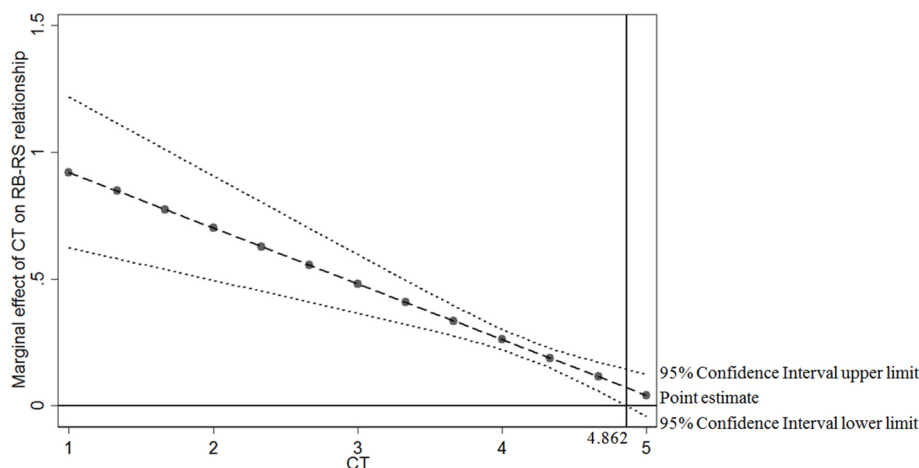


Fig. 3. Moderating effect of critical thinking (CT) on the relationship between rumor belief (RB) and rumor sharing (RS).

Table 5

Conditional indirect effects of IASM on RS via RB at values of IATM and CT.

IATM	CT	Effect	SE	95% confidence interval
Low	Low	−0.071	0.019	[−0.108, −0.034]
Low	Moderate	−0.042	0.010	[−0.064, −0.023]
Low	High	−0.020	0.008	[−0.038, −0.008]
Moderate	Low	−0.054	0.016	[−0.086, −0.023]
Moderate	Moderate	−0.030	0.008	[−0.046, −0.016]
Moderate	High	−0.013	0.006	[−0.027, −0.004]
High	Low	−0.037	0.016	[−0.068, −0.006]
High	Moderate	−0.018	0.009	[−0.036, −0.002]
High	High	−0.006	0.006	[−0.020, 0.005]

Note: RS: rumor sharing; RB: rumor belief; IASM: information acquisition from social media; IATM: information acquisition from traditional media; CT: critical thinking; SE: standard error.

influencing individuals' opinions and decisions (Varshney & Vishwakarma, 2020). Hence, it is of great practical significance to investigate the dissemination of rumors on social media in the context of COVID-19 and seek effective measures against the spread of rumors in the effort to fight COVID-19. Accordingly, in this study, we investigated the relationship between information acquisition from social media, rumor belief and rumor sharing, and—more importantly—the contingency effects of information acquisition from traditional media and critical thinking.

This study offers several key findings. First, our analysis revealed a negative relationship between information acquisition from social media and rumor sharing. Given the proliferation of smartphones and other mobile devices, social media has become an increasingly important source for individuals to obtain health information. According to one view, the use of social media provides numerous opportunities to disseminate rumors (Li et al., 2021d). In this regard, our findings suggest a promising aspect of the acquisition of information from this source. Owing to the abundant sources and extensive real-time informational interactions, information acquisition from social media lends itself to opportunities for verification and treatment with more cautiousness and, thus, may reduce rumor sharing. This finding suggests that social media can serve as an effective platform for the dissemination of health information.

Second, rumor belief was shown to have a significant mediating effect on the relationship between information acquisition from social media and rumor sharing. Our findings indicate that rumor belief is a critical prerequisite for rumor sharing, which is consistent with the results of prior studies (Li & Sakamoto, 2014). Moreover, our findings highlight that with access to abundant instant information and additional opportunities for validation, information acquisition from social media reduces the likelihood of rumor belief and, therefore, reduces the potential for rumor sharing.

Third, we confirmed that information acquisition from traditional media weakens the negative relationship between information acquisition from social media and rumor belief. As illustrated in Fig. 2, the negative relationship between information acquisition from social media and rumor belief declines as social capital inertia increases. In fact, traditional media are considered a more professional, authoritative information-release platform. Additionally, our results imply that individuals might be less likely to take action in the interest of verification based on information acquisition from social media when the information on traditional media supports rumors. This finding also indicates that rumors in traditional media will have more negative effects than expected. Although social media is generally seen as more widely used, people turn to traditional media for trustworthy and relevant information during some unexpected events (Wang & Zhuang, 2018). Moreover, with the social media transformation of Chinese traditional media in recent years, the forms that people employ in making contact with traditional media have expanded (Huang & Lu, 2017). Traditional media still play an important role in shaping individuals' information

decision and it deserves attention, at least in the Chinese context.

Furthermore, critical thinking weakens the positive relationship between rumor belief and rumor sharing. Critical thinking is a fundamental mechanism that one may use to prevent the spread of rumors, fake news, and misinformation (Amaral et al., 2020). Individuals with higher critical thinking are more objective and rational in considering information, opinions, and beliefs. They are also more cautious about drawing conclusions and deciding to take action. Therefore, even if they possess rumor belief, these individuals are less likely to share rumors.

In addition, the moderating effect of critical thinking on the relationship between information acquisition from social media and rumor belief emerged as not significant. One possible explanation is that information acquisition concerning COVID-19 on social media is combined with abundant information sources and a large amount of real-time information interactions (Chung, 2017; Xu, 2020), which provides individuals opportunities to verify such information and treat it more cautiously before believing rumors, and these effects are not significantly influenced by critical thinking. Next, we will discuss the theoretical contributions, practical implications, and limitations. Future research directions will also be considered.

5.2. Theoretical contributions

First, this study enriches the rumor literature by incorporating the perspective of information acquisition to explain rumor behaviors during the COVID-19 pandemic, providing a brand new lens for rumor research. In particular, the study distinguishes two types of information acquisition and explores the interplay between social media and traditional media in explaining rumor sharing on social media. This approach fills a gap in the literature, which has previously focused on the mechanism of rumor diffusion on online social media and has considered information acquisition but has rarely combined information acquisition from traditional media and online social media in the same research framework (Xu, 2020). In this study, we consider the interaction between traditional media and social media in transmitting rumors, given that different channels may provide information that verifies or disproves information from the other source. The results indicate that traditional media weaken the negative relationship between information acquisition from social media and rumor belief. Thus, this study emphasizes the necessity for simultaneous consideration of information from different information acquisition media.

Second, this study extends the literature on rumor sharing by identifying the underlying mechanism of the linkage between information acquisition and rumor behavior with the unique role of rumor belief. Many prior studies have emphasized either individuals' trust in rumors or their willingness to share (Chua & Banerjee, 2018; Marett & Joshi, 2009). though one recent investigation juxtaposed both trusting and sharing intentions in the same study (Chua & Banerjee, 2018; Wang et al., 2018). Nevertheless, few studies have analyzed the effect of rumor belief on the ultimate behavior of rumor sharing. In this study, we argue that rumor belief is a crucial factor in mediating the considered independent variables and rumor sharing, and our findings highlight a significant mediating effect of rumor belief on the negative relationship between information acquisition from social media and rumor sharing.

Third, this study contributes to the understanding of the role of individuals' thinking styles in fighting COVID-19 rumors by highlighting the contingency effects of critical thinking. Critical thinking, which has been widely discussed in education and other individual development research, has been shown to significantly affect outcome variables, including individual ability and performance (Akpur, 2020; Dwyer et al., 2014; Li et al., 2021c; Li & Sakamoto, 2014; Ren et al., 2020). However, although these studies have highlighted that individual characteristics and other internal factors significantly influence rumor propagation, research on the mechanism of critical thinking at the individual level remains limited (Cheng et al., 2020). In this study, we introduced critical thinking as a moderator in our research model,

finding that it significantly weakens the positive relationship between rumor belief and rumor sharing. Thus, this study extends the literature on online rumor decisions by revealing the moderating effects of critical thinking.

Finally, this study provides one of the first attempts to explain COVID-19 rumors in the digital society of social media in the information science field. As a worldwide disaster, COVID-19 imposed thorough changes on modern life, both online and offline, giving rise to many rumors. On a separate but related note, the popularity of social media was long believed to succor a hotbed of rumors. As one of the first to examine the topic of interest, this study explores how information acquired from social media shapes users' decisions regarding rumors and further investigates the joint role of traditional media and the contingent role of critical thinking. In doing so, this study not only reveals the positive role of social media in rumor diffusion but also increases the current knowledge of the diffusion of COVID-19 rumors on social media.

5.3. Practical implications

The study findings also provide some practical implications for reducing rumor dissemination. For the focal actors, the online users, the key implication is that they should improve their critical thinking and be critical and skeptical about the information to which they are exposed. In line with our findings, critical thinking enables individuals to integrate information more effectively and act in a more cautious, mature way, which can eventually decrease rumor sharing. Another finding is that people should reduce their reliance on traditional media and try to use social media to obtain information for multisource verification, especially during the ongoing COVID-19 pandemic. In addition, no one should engage in rumor sharing before exercising rational judgment and careful consideration since it may have serious effects on the online sharing of health information.

The second implication concerns the development of an information dissemination environment that encourages user interactions and the cultivation of critical thinking of users by platform managers and policymakers. Although rumors are typically spread through online social media at present, other channels (e.g., traditional media) can also affect rumor dissemination. Considering the moderating role of critical thinking, platform managers should modify the platform mechanism to guide users to be more critical. Consequently, rumors without enough evidence would be shared less. In addition, providing users with more convenient and extensive information exchange channels can effectively reduce the spread of rumors. Moreover, based on the moderating effects of information acquisition from traditional media, policymakers should regulate the release process of official information on traditional media and avoid official rumors, especially in the context of fighting COVID-19. An effective approach could be to publish official information on an online platform that can interact with the audience and thereby receive user feedback and uncover false information in the posted content in a timely fashion.

5.4. Limitations and future directions

Although this study offers promising results regarding rumor transmission during the 2020 COVID-19 pandemic, it has several limitations that future research can address. First, despite the timely collection of data during the COVID-19 outbreak, the cross-sectional nature of the data did not allow us to explore whether and how the effects observed in this study continued over time. Thus, future studies may find it informative to measure rumor-sharing behaviors at different time points to reveal the potential mechanism of rumor dissemination during the current pandemic. Second, the measurement of information acquisition from traditional media applying a single item may not be sufficiently

robust. The concept of traditional media is well-defined in Chinese; furthermore, in the study, we clearly designated the various types of traditional media to eliminate ambiguity and confusion, according to the suggestions of Wanous and Hudy (2001) and Delerue (2018), which made it acceptable to measure the construct with one item. Nonetheless, the measurement the construct with one item falls short of the ideal. Future studies may measure the construct via multiple items to further test our results. Third, the survey data were collected from one source (specifically, online questionnaires), and the measures for focal variables (e.g., critical thinking) were adapted from previous scales to fit the rumor context during COVID-19. The use of multiple data sources and more objective measurements for variables may enhance the validity of our results. Fourth, this study included only traditional media and critical thinking as moderating variables. However, other studies have suggested the possibility that other personal traits and situational factors can affect individuals' rumor-sharing decisions (Bodaghi & Oliveira, 2020; Cheng et al., 2020; Lai et al., 2020). Therefore, future studies might further analyze these internal and external contextual variables. Similarly, other mediating variables, including anxiety and fear, should also be considered (Marett & Joshi, 2009), and the mediators should be experimentally manipulated to improve the validity of the measurements. Moreover, the attempt to boost status and accumulate reputational capital in social networks can be a significant driver of rumor sharing on social media, which calls for a deeper investigation to enhance the understanding of rumor behavior. Lastly, the survey was conducted only in the Chinese context. It would be interesting to see whether the study's conclusions might be generalizable to other cultural contexts, constituting another avenue for future studies.

6. Conclusion

Alongside the COVID-19 outbreak, rumor-sharing behavior on social media has been increasing. In order to fight rumors to fight COVID-19, we investigated the mechanism of rumor sharing on social media. Our findings indicate that information acquisition from social media hinders rumor belief and rumor sharing, while rumor belief facilitates rumor sharing. Information acquisition from traditional media alleviates the hindering effect of information acquisition from social media on rumor belief, whereas critical thinking diminishes the conductive effect of rumor belief on rumor sharing. Thus, our study contributes to the streams of literature on information acquisition, rumor sharing, and critical thinking. We also call for attention to countering rumors about COVID-19 on social media in the future.

Credit author statement

Feng Guo: Conceptualization, Methodology, Writing - original draft, Apan Zhou: Data curation, Investigation, Writing - original draft, Xiaofei Zhang: Conceptualization, Supervision, Xinxiang Xu: Introduction, Writing - review & editing, Xuekun Liu: Literature review, Writing - review & editing.

Data availability

Data will be made available on request.

Acknowledgments

This work is partially supported by the National Natural Science Foundation of China (72271131 & 71902135), Young Elite Scientist Sponsorship Program by Tianjin (TJSQNTJ-2020-12), and Shandong Industrial Internet Innovation and Entrepreneurship Community.

Appendix A. Measurement scales

Construct	Items	Source
Rumor sharing (RS)	RS1: I have shared some virus-related rumors (randomly assigned by the system) on my Weibo or WeChat when I did not know they were rumors. RS2: I have shared some virus-related rumors (randomly assigned by the system) to my family and friends when I did not know they were rumors. RS3: I have shared some virus-related rumors (randomly assigned by the system) unconsciously when I did not know they were rumors.	Venkatesh et al. (2003), Zhang et al. (2021a)
Rumor belief (RB)	Have you ever believed the following rumors? RB1: Shanghai Institute of Medicine and Wuhan Institute of Virology jointly discovered that Chinese patent medicine Shuanghuanglian oral liquid can inhibit COVID-19. RB2: Drinking high alcohol gives resistance to the new coronavirus. RB3: Research by Zhong Nanshan's team shows that the COVID-19 infection rate of smokers is lower than that of non-smokers. RB4: Drinking Banlangen and smoked vinegar can prevent COVID-19. RB5: US lawmakers claim that the virus is a biological and chemical weapon leaked by the Wuhan laboratory. RB6: Zhong Nanshan: After the COVID-19 is cured, there will be sequelae, which is more serious than SARS. RB7: The coronavirus will adhere to the surface of fruits and vegetables. RB8: Eating pork can infect you with COVID-19.	Kwon and Rao (2017)
Information acquisition from social media (IASM)	IASM1: I usually use online social media (e.g., Weibo) to acquire virus-related information on the outbreaks. IASM2: I often use online social media (e.g., Weibo) to get information from people who have knowledge about the virus. IASM3: If I have a problem about the virus, I usually seek advice from online social media (e.g., Weibo).	Oh et al. (2013)
Information acquisition from traditional media (IATM)	I usually use traditional media (e.g., newspaper) to acquire virus-related information in the outbreaks.	Oh et al. (2013)
Critical thinking (CT)	CT1: I deal with my issues related to the virus rationally by learning without getting terrified of the pandemic. CT2: I can develop an objective and comprehensive idea on the virus issues. CT3: I can think of alternative ideas when I read or hear something about the virus issues.	Littlejohn et al. (2016), Reparaz et al. (2020)

Appendix B. Items in questionnaire

Construct	Items	Source
Rumor sharing (RS)	RS1: 在不知道是谣言时，我曾在社交媒体（微博/微信等）上分享过某些疫情谣言 RS2: 在不知道是谣言时，我曾向家人或朋友分享过某些疫情谣言 RS3: 我曾在不经意间传播过疫情谣言	Venkatesh et al. (2003), Zhang et al. (2021a)
Rumor belief (RB)	第一次遇到这样的疫情信息，您相信了吗？ RB1: 上海药物所、武汉病毒所联合发现中成药双黄连口服液可抑制新型冠状病毒 RB2: 饮用高度数酒能抵抗新型冠状病毒 RB3: 钟南山团队研究表明，吸烟者病毒感染率低于非烟民 RB4: 喝板蓝根和熏醋可以预防新型冠状病毒 RB5: 美议员宣称病毒是武汉实验室泄露的生化武器 RB6: 钟南山：新冠肺炎治愈后会留后遗症，比SARS严重 RB7: 果蔬表面会附着新型冠状病毒 RB8: 吃猪肉会感染新型冠状病毒	Kwon and Rao (2017)
Information acquisition from social media (IASM)	IASM1: 疫情期间，我经常使用社交媒体（微博、微信等）获取疫情相关信息。 IASM2: 我经常通过社交媒体（微博、微信等）从拥有相关知识的人群获取疫情信息 IASM3: 如果我有疫情相关的问题，我会通过社交媒体（微博、微信等）征求建议	Oh et al. (2013)
Information acquisition from traditional media (IATM)	疫情期间，我经常使用传统媒体（广播、电视、报纸等）获取疫情相关信息	Oh et al. (2013)
Critical thinking (CT)	CT1: 在处理疫情相关的问题时，我感到惊慌失措 (R) CT2: 当我表达自己对疫情的相关意见时，要保持客观是很难的 (R) CT3: 我的注意力很容易受到外界疫情的影响 (R)	Littlejohn et al. (2016), Reparaz et al. (2020)

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