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“I enjoy thinking critically, and I’m in control”: Examining the influences of media literacy factors on misperceptions amidst the COVID-19 infodemic

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ABSTRACT

Misinformation circulation has arguably reached a peak during the COVID-19 pandemic, creating an “infodemic” that severely endangers public health and well-being. Using a moderated mediation model, a survey of 712 respondents from China reveals that social media information seeking is positively associated with COVID-19 misperceptions, while need for cognition (NFC) is negatively associated with it. Both relationships became more significant while mediating through individuals’ general misperceptions. Moreover, it is found that among those with greater locus of control over media, the association between social media information seeking and COVID-19 misperceptions became more positive, while the association between NFC and COVID-19 misperceptions became more negative among those with greater media locus of control. Findings provide insights into the misperception research and have practical implications regarding infodemic management.

1. Introduction

The COVID-19 pandemic has led to the largest public health crisis facing the mankind in a century (Guillon, 2020). The director-general of the World Health Organization stressed, “we’re not just fighting a pandemic; we’re fighting an infodemic.” An “infodemic” refers to the prevalence of misinformation, disinformation, fake news, and conspiracy theories, which potentially deters preventive measures and obstructs the effectiveness of the global management (Vraga et al., 2020). Since the beginning of the pandemic, a sizable portion of research has been dedicated to the investigation about the antecedents, the disseminating mechanisms, and the ramifications of this infodemic (e.g., Barura et al., 2020; Bridgman et al., 2020; Su, 2021). Albeit substantially growing, the extent research in the COVID-19-related misperceptions has generated sporadic, and even contradictory conclusions, a consensus on the effective and context-tailored strategies to reduce the COVID-19-related misperceptions remains unreached.

Considering the severe consequences of the infodemic, researchers have endeavored to explore the role of social media use in potentially intensifying misperceptions (e.g., Kim et al., 2014; Shin et al., 2018). It is widely known that on social media platforms, institutional gatekeepers have traditionally been absent, and effective fact-checking strategies

have not yet been fully implemented (Su, 2021). The currently applied fact-checking and information governance methodologies include but are not limited to tagging and flagging unverified posts, diffusing corrective messages, and blocking accounts said to be potentially fake and harmful (Andersen & S e, 2020). Pundits and scholars accentuated a few disadvantages of these mechanisms. First, these strategies have not been institutionalized in that many are based on subjective identification of the platform managers or the algorithms (e.g., Andersen & S e, 2020). Second, these methodologies are not equally applied to all platforms but only to a few (e.g., Su, 2021). Moreover, plenty of corrective messages are biased in terms of not only the sharing selectivity but also the spreaders’ partisanships (e.g., Shin & Thorson, 2017). Additionally, and maybe more importantly, these fact-checking methods can further raise serious social and political questions about “the values, motives and ideologies inscribed in the algorithms designed to flag or tag fake news,” because the technical fix betrays the democratic value of conversation and is not able to solve the fundamental problems (Andersen & S e, 2020, p. 127). Some in-depth interviews also showed that both journalists and social media users, notwithstanding perceiving these fact-checking mechanisms as sometimes useful, expressed strong distrust in them (Brandtzaeg et al., 2018, p. 1109). Considering these traps, scholars have highlighted the cognitive barrier role that

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individuals' media literacy could play to mitigate and resist misperceptions (e.g., Austin et al., 2021; Jang & Kim, 2018).

In addition, people's need for cognition, such as their capability to critically analyze each piece of information, was found to assist individuals to establish an internal immunization toward misinformation (e.g., Austin et al., 2016; Xiao, Su, & Lee, 2021, pp. 1–12). The formation of misperceptions relevant to COVID-19 might also be due to various antecedents other than people's media consumption behaviors and literacy. For instance, the extent to which an individual believes in general conspiracy theories and misinformation could also denote her/his conspiracist tendency, likely shaping the degree of their COVID-19-specific misperceptions (Nyhan & Reifler, 2015).

Admittedly, China has been in the epicenter of public opinions since the beginning of the COVID-19 pandemic, and its scientific community has been playing a role in governing the infodemic. However, only a handful of infodemic studies has been contextualized in China, explicating the spread of misinformation and the formation of misperceptions among Chinese people (e.g., Su et al., 2021; Zhang et al., 2021). Contextualizing in China would not only help revisit media effects largely confirmed in the Western context, but also heed the call to include developing countries to mitigate the asymmetry of contextualization in communication research (Adjei-Bamfo et al., 2019).

Taken together, this study has three main purposes: (1) to understand the impact of social media information-seeking on COVID-19 related misperceptions; (2) to examine the effect of need for cognition on these misperceptions, (3) to investigate whether individuals' pre-existing general misperceptions play a role in mediating the above relationships, and (4) to explore whether one's locus of control over media information could moderate the associations among Chinese people.

1.1. Defining misinformation and misperceptions

Misinformation has been conceptualized as the "presence of ... objectively incorrect information" (Bode & Vraga, 2015, p. 621); while misperception refers to "cases in which people's beliefs about factual matters are not supported by clear evidence and expert opinion" (Nyhan & Reifler, 2010, p. 305). The difference is evident. Misinformation refers to incorrect "information itself," (p. 137), while misperceptions pertain to a set of beliefs in misinformation that lacks evidence and expert supports (Vraga & Bode, 2020). Despite the conceptual difference, misinformation and misperceptions can also go hand in hand. Specifically, people who generate or spread misinformation must hold misbeliefs and misperceptions of an issue beforehand. Similarly, people who have incorrect beliefs must be misinformed at first (Bode & Vraga, 2015; Kuklinski et al., 2000).

It also warrants mentioning that the concepts of misinformation and disinformation are often confused. Prior studies have clarified that disinformation speaks to information that are deliberately fabricated for manipulative communication, while misinformation only focuses on the incorrectness without highlighting the motivation (Hameleers & Minihold, 2020; Stahl, 2006). The current study focuses on misinformation.

Due to its ubiquity and promptness, as well as the inadequacy of the institutional gatekeeper and fact-checking mechanism, social media has often been blamed for enabling and facilitating the inseparable connection of misinformation and misperception (Su, 2021). For instance, Sharma et al. (2017) found that Zika-related misinformation was circulated more rapidly and widely on social media. In the case of COVID-19, research also showed that a spate of popular conspiracy theories was first generated and spread on social media (e.g., Kouzy et al., 2020; Pennycook et al., 2020). Given that plenty of people use social media, exposure to misinformation could be inevitable (Smith & Anderson, 2018). Indeed, scholars further revealed that people with greater social media use (e.g., seeking news information) are more likely to have higher misperceptions about COVID-19 (e.g., Allington et al., 2021; Su, 2021; Xiao, Borah, & Su, 2021).

The consequences could be grave. Research indicated that

misinformation not only compromises deliberative democracy but also promotes rejection of science and increases reluctance to engage in recommended behaviors (Jolley & Douglas, 2014; Lewandowsky et al., 2015; Vraga et al., 2020). Indeed, during the COVID-19 pandemic, individuals with higher misperceptions are significantly less likely to take health-protective measures, which puts public health in danger (Allington et al., 2021).

1.2. Social media information-seeking and misperceptions

With the constant advancements in technology, information becomes readily accessible, and the practice of information seeking on social media is consistently growing (Pang et al., 2014). Online spaces, such as social media platforms, are crowned as primary sources of diverse information (e.g., Knight et al., 2015). To satisfy the needs to know, more individuals are now turning to online platforms, including microblogs such as Twitter, video-sharing sites such as YouTube, and Wikipedia, to acquire news and updates (Kim et al., 2014). For example, it was found that over half of the Internet users have sought health information on the net, and health-related updates have become the most widely searched type of information across social media platforms (Gold et al., 2012; Thackeray et al., 2013). As such, social media platforms present a multitude of information-seeking options. With the technological advancements, the trend of information seeking on social media has been persistently gaining momentum.

As information seeking has the capacity to facilitate changes in beliefs and behaviors, scholars have been closely examining the trend of information seeking on social media and its effects (e.g., Brashers et al., 2002; Grajales et al., 2014). Essentially, social media are regarded as bridges where laypeople obtain knowledge originally unhandy (Knight et al., 2015), such as healthcare science. Previous studies found that people who sought online health information perceived themselves as more capable in terms of healthcare management approaches and more subjected to different options of treatments (e.g., Broom, 2005; Kivits, 2004). As such, information seeking on social media platforms widely influences users' beliefs and behaviors for various perspectives.

Despite the grips of information seeking on social media, there has been a solemn concern regarding the veracity of information on the platforms (Kim et al., 2014). Other than acquiring information, users also express outsider opinions and disseminate information that is stemmed from unsubstantiated claims (Himmelboim et al., 2020). Therefore, the overwhelming use of social media platforms, in which unfiltered contents are mostly not forbidden, also unleashes the vast diffusion of misinformation in parallel (Chou et al., 2018). Worse still, misinformation has been shown to contribute to misperceptions. In the domain pertinent to healthcare, it was found that 20% of those who held wrong beliefs regarding vaccine had sought information from social media platforms in the past (Corwin, 2020). Additionally, prior studies also found that more people are now refusing to take healthcare measures for disease prevention after consuming misinformation on social media platforms (Larson, 2018; Massey et al., 2020).

Since the outbreak of COVID-19 pandemic, there has been an overflow of misinformation about the disease across social media platforms (Xiao, Su, & Lee, 2021, pp. 1–12). A spate of studies has already demonstrated the significant linkage between the use of social media as a source of information about COVID-19 and the increased misperceptions (e.g., Allington et al., 2021; Enders et al., 2021). Following this vein, the first hypothesis is posited:

H1. Social media information-seeking of COVID-19 would be positively associated with COVID-19 misperceptions.

1.3. Need for cognition (NFC) and misperceptions

Need for cognition (NFC) has been defined as "a stable personality trait that describes individuals' tendency to engage in and enjoy effortful

cognitive activity” (Cacioppo & Petty, 1982; Lins de Holanda Coelho et al., 2020, p. 1870). In other words, individuals high in NFC tend to mindfully process information encountered via an “analytical approach that is active, conscious, effortful, logical, intentional, and therefore more comprehensive” (Austin et al., 2016, p. 601). Individuals low in NFC, however, are (1) more likely to rely on the heuristic processing approach that requires less cognition effort to make sense of new information (Lins de Holanda Coelho, 2020) and (2) more likely to “suffer from information overload” than those high in NFC (Putrevu, 2008, p. 61).

To operationalize NFC, scholars have developed a series of items to measure and report the extent to which individuals enjoy cognitive efforts (Austin et al., 2016; Cacioppo & Petty, 1982; Su et al., 2021). Traditionally, NFC was operationalized using an 18-item scale (Cacioppo et al., 1984), measuring individuals’ attitudes toward some questions such as whether thinking is fun or boring, and whether they enjoy situations and tasks that challenge their thinking abilities (e.g., Austin et al., 2016; Cacioppo et al., 1984; Cacioppo & Petty, 1982). The construct of NFC has also been introduced to the communication field, entailing mainly the ability that individuals are intrinsically motivated and to undertake effortful processing of messages from media (e.g., Lins de Holanda Coelho et al., 2020; Malhotra, 1982; Putrevu, 2008).

More importantly, prior research has demonstrated a positive association between NFC and media literacy—a critical skill set that helps individuals efficiently navigate through the digital environment (Koc & Barut, 2016; Lin et al., 2013). Some have also regarded NFC as one of the subcategories of the broader domain of media literacy (e.g., Su et al., 2021). For instance, research suggested that people high in NFC are more likely to analyze information at hand critically using more information skills (e.g., Heijltjes et al., 2014). NFC positively predicted critical thinking about information sources so that people avoid blindly consuming information (e.g., Austin et al., 2016). A higher level of NFC helps individuals to gain more self-efficacy in information consumption (e.g., Britt & Hatten, 2013). NFC also promotes skepticism about social media information, which in turn stimulates more media literate behaviors such as fact-checking (e.g., Vraga & Tully, 2021).

Given its close tie with media literacy, NFC’s negative association with misperceptions is rather pronounced. Through examining the interplay between NFC, media literacy, and HPV vaccine-related misperceptions, Xiao, Su, and Lee (2021) unearthed that a higher level of NFC is linked with fewer misperceptions. Su et al. (2021) argued that individuals with higher NFC would “critically and comprehensively analyze” information and “less likely to endorse conspiracy theories” (p. 3). Building upon the literature, the next hypothesis is proposed:

H2. NFC would be negatively associated with COVID-19 misperceptions.

1.4. General misperceptions as mediator

With a diversity of misinformation being consumed on social media, people’s general perception could be negatively affected. Ever since the emergence of social media, a myriad of misinformation has been rampantly circulating without geographical constraints. Popular conspiracy theories that are propagated on social media cover a wide range of topics and have garnered attention of communication and psychology scholars, such as the missing of Malaysia Airlines flight number 370 (MH370) (e.g., Van de Winkel, 2015), the proposition of climate change (Douglas & Sutton, 2015), and the conspiracies about 911 (Sampson, 2010). With the built-in functionalities and affordance indicators such as shares, likes, and retweets, questionable claims and misinformation of diverse topics can be conveniently disseminated (Apuke & Omar, 2021; Lazer et al., 2018). As numerous misinformation exists on social media and misinformation has been shown to contribute to misperception (e.g., Borah et al., 2021; Corwin, 2020; Larson, 2018; Massey et al., 2020), it is possible that individuals who seek information on social media

would develop general misperceptions or conspiracy theory endorsement.

Having general misperceptions could be detrimental to one’s understanding for different specific topics. Based on previous studies (e.g., Goertzel, 1994; Lewandowsky et al., 2013; Swami et al., 2009), one’s proclivity to endorse conspiracy theories is overarching, in a way that her/his ideation leading to misperceptions is not confined to one singular topic of misinformation, but across disparate topics of misinformation. For example, Lewandowsky and associates (2013) found that endorsement of conspiracy theories predicted rejection of other scientific findings, and the results of the study suggested that the tendency to endorse misinformation is rooted in the person’s dispositional attributes (Lewandowsky et al., 2013). Echoing Lewandowsky et al. (2013), Kosowska and Bukowski (2015) found that personal characteristics determined the tendency of misinformation endorsement, implying that those individuals had stable and predictable trajectories for developing misinformation beliefs across different context-specific domains. By the same token, it is possible that one would have higher tendency to develop COVID-19 misperceptions if that person has already attained general misperceptions.

Regarding intrinsic personal factor, NFC that reflects one’s preference for cognitively challenging tasks was found to better defend an individual from endorsing misinformation (e.g., Hess et al., 2012). Previous studies found that NFC is associated with sophisticated thinking styles (e.g., Hess et al., 2011), suggesting that people with higher NFC would incline towards standards for cognitive processes. Therefore, it is possible that individuals with higher NFC would have lower tendency to develop general misperceptions. Based on the literature, we formulate the following hypotheses:

H3. General misperceptions would mediate the associations between (a) social media information-seeking and COVID-19 misperceptions, and (b) NFC and COVID-19 misperceptions.

1.5. Media locus of control (MLOC) as moderator

Conceptualized as “mastery of one’s environment” (Rubin, 1993, p. 162), locus of control (LOC) pertains to the extent to which individuals perceive their behaviors as under their own control (Broos & Roe, 2006). Therefore, people with greater LOC oftentimes hold that their experiences hinge on their behaviors, rather than fate, luck, or other external factors (Koo, 2009). Comparatively, individuals with lower LOC usually attribute their personal experiences to fate or factors beyond their own control (Broos & Roe, 2006; Koo, 2009; Rubin, 1993).

Extending the original conceptualization of LOC, communication scholars have coined and termed the idea of media locus of control (MLOC), which denotes the ability to control one’s media environment (Maksl et al., 2015; Ku et al., 2019). People with higher MLOC often hold that the media contents they could encounter and consume are under their own controls (Wallston et al., 1978). On the contrary, those with lower MLOC tend to believe that it is difficult for them to rely on consumptive curatorial efforts to circumvent the content they don’t like and consume what they expect (Ashley et al., 2017). In a nutshell, MLOC speaks to “the extent to which individuals perceive themselves as being in control of news” (Ku et al., 2019, p. 33).

Given this conceptualization, MLOC is regarded as, along with knowledge structure and mindful processing, one dimension of media literacy (Ashley et al., 2017). Maksl et al. (2015) validated this relationship, indicating that media literate teens felt more in control of their associations with media, compared to those less media-literate. The rationale is rather obvious: individuals believing that they have control over their media environments are generally not easily led by misinformation fabricated by some media or individuals (Murrock et al., 2018).

In the current study, MLOC is expected to serve as a moderator upon which (1) the direct effects of SMIS and NFC on general misperceptions

and (2) the indirect effects of SMIS and NFC on COVID-19 misperceptions are contingent. Decades of studies have already lent credence to the moderating role LOC plays (e.g., Chiu, 2003; Koo, 2009; Walsh, 2010). Walsh (2010) indicated that individuals with higher sense of locus of control took more active measures to avoid advertisements on the Internet. When it comes to MLOC, Murrock et al. (2018) suggested that individuals scored higher in MLOC “can avoid being misinformed by paying attention to different sources of news” (p. 56). Hence, the following hypotheses are posited:

H4a. : MLOC would moderate the association between social media information-seeking and general misperceptions, such that the association would be more positive among those with lower MLOC.

H4b. : MLOC would moderate the mediated associations between social media information-seeking and COVID-19 misperceptions, such that the association would be more positive among those with lower MLOC.

Moreover, as NFC and MLOC are both dimensions of media literacy and were both extensively found to reduce misperceptions (Ashley et al., 2017; Maksil et al., 2015; Murrock et al., 2018; Vraga et al., 2015). We hypothesize that there would be an interaction effect between NFC and MLOC on misperceptions, both general and COVID-related. Hence, the final set of hypotheses is formulated:

H5a. : MLOC would moderate the association between NFC and general misperceptions, such that the association would be more negative among those with higher MLOC.

H5b. : MLOC would moderate the mediated association between NFC and COVID-19 misperceptions, such that the association would be more negative among those with higher MLOC.

Conventional theoretical frameworks such as the health belief model (HBM) suggest that individuals’ personality factors can first influence their perceptions and health motivations, which in turn intensify beliefs and trigger actions (Hochbaum, 1958), constituting a mediation model. Many in health communication have also incorporated news use as independent variable and other psychological factors as moderators into the HBM, predicting their nuanced effects on the formations, crystallizations, and changes of attitudes and behaviors (e.g., Ahadzadeh et al., 2015; Jones et al., 2015). Along this research line, our study takes a step further and includes social media information seeking in addition to NFC as an independent variable, general misperceptions as the mediator, and MLOC as the moderator, to predict COVID-related misperceptions. Juxtaposing our hypotheses, Fig. 1 exhibits the full moderated mediation model.

2. Method

The human subject institutional review board (IRB) of a large Northwestern university in the United States has determined that the study satisfies the criteria for Exempt Research. Upon the IRB approval, we collected survey data using Qualtrics, an extensively utilized online questionnaire platform. Data were collected anonymously in two major cities in China, Xi’an and Qingdao, from March 3rd through April 18th, 2020. Before initiating the survey, we obtained informed consent from our participants. 1081 respondents aged 18 and above have participated. The exclusion of incomplete samples yielded a total of 712 valid samples. Among the 712 respondents, slightly over half were female (67.8%), and the age ranged from 18 through 65 ($M = 23.26$, $SD = 5.68$). The original questionnaire was in simplified Chinese and was translated into English prior to analysis.

2.1. Measures

2.1.1. Social media information-seeking (SMIS)

Adapted from and modified prior research (Goyanes et al., 2021), three items were used to assess SMIS. The respondents were asked to indicate the frequencies with which they use Weibo, WeChat, and Zhihu, three popular social media platforms in China, to seek news information about COVID-19, via a 5-point Likert scale (1 = never, 5 = several times a day) ($M = 1.96$, $SD = 0.66$, $\alpha = 0.72$).

2.1.2. Need for cognition (NFC)

Consistent with prior research (e.g., Austin et al., 2016; Su et al., 2021), the respondents indicated their extents of agreement with six statements, such as “I would prefer complex to simple problems,” “Thinking is not my idea of fun,” “I like to have the responsibility of handling a situation that requires a lot of thinking,” “I would rather do something that requires little thought than something that is sure to challenge my thinking abilities,” and “I like dealing with the problems that requires a lot of cognitive efforts.” Two items were reverse coded before analysis ($M = 3.54$; $SD = 0.60$, $\alpha = 0.80$).

2.1.3. Media locus of control (MLOC)

Adapted from previous research (e.g., Craft et al., 2017), MLOC was measured with three items. Respondents were asked to indicate the extent to which they agree with the following statements, “I am in control of the information I get from the news media,” “I feel like what happens in my social media feeds is mostly determined by non-accidental happenings,” and “if I encountered some information I did not expect to see, I can determine where and when to obtain the information I wanted” via a 5-point Likert scale (1 = strongly disagree, 5

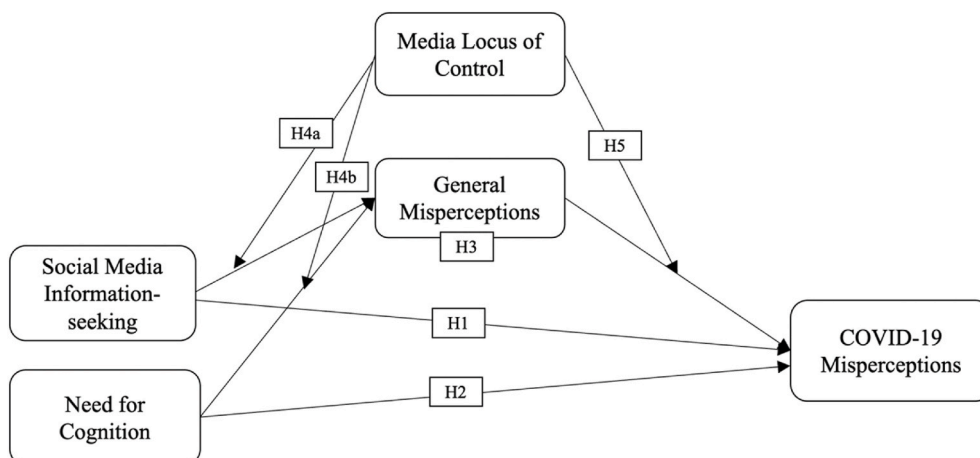


Fig. 1. Proposed moderated mediation model.

= strongly agree) ($M = 3.33, SD = 0.83, \alpha = 0.71$).

2.1.4. General misperceptions

Adapted from prior research (e.g., Xiao, Borah, & Su, 2021), we assessed general misperceptions using six items. The respondents were asked to rate their agreement with the following agreements, “911 was a hoax; it was the result of a controlled demolitions by the U.S. government,” “The moon landing was a hoax; it was staged in a Hollywood studio,” “The British Princess Diana was murdered by an intelligence agency,” “The missing of the flight MH370 was due to the political games between superpowers,” “There are aliens in the Area 51 in Nevada, collaborating with the U.S. army,” and “Climate change is a hoax; the climate is always changing and what we have been experiencing was just a period of the natural fluctuation” via a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree) ($M = 2.47, SD = 0.78, \alpha = 0.84$). Specifically, if a respondent agrees with the content of the respective statement without doubts, “strongly agree” with a certain item is selected, and vice versa.

2.1.5. COVID-19 misperceptions

Adapted from prior research (Su et al., 2021), COVID-19 misperceptions were assessed through seven items. The respondents were asked rate their agreements with seven statements, including “The coronavirus is human made,” “The coronavirus was created by Western governments, aiming to attack China,” “The COVID-19 pandemic was a part of the political war between China and the West,” “The coronavirus was a bioweapon used by Western countries,” “The spread of the coronavirus was due to a laboratory leak,” “The coronavirus was first brought into China by foreign army,” and “The coronavirus is not related to politics, it is due to natural reasons” via a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). The last item was reverse coded ($M = 1.34, SD = 0.94, \alpha = 0.90$). The Likert scale represents the nuanced extents of agreement. Specifically, if a respondent agrees with the content of a certain statement without doubts, “strongly agree” is selected in the scale, and vice versa.

2.1.6. Exogenous (control) variables

Initially, we controlled for the following demographics: age ($M = 23.26, SD = 5.68$), gender (67.8% female), education ($M = 5.29$ [Completed college education], $SD = 0.77$), and monthly income ($M = 1.00$ [2000 to 5000 RMB], $SD = 1.54$). In addition, as political efficacy plays a significant role in affecting individuals’ attitudes toward scientific issues (Knight & Barnett, 2010), we controlled for political efficacy to avoid spurious associations. The participants rated their agreements with three statements, “I feel that I have a pretty good understanding of the important political issues facing our country,” “I consider myself well-qualified to participate in politics” and “I feel that I have the ability to change the country and the society” (0 = strongly disagree, 5 = strongly agree) ($M = 2.54; SD = 0.84, \alpha = 0.76$). Lastly, as social media information-seeking being one of our independent variables, we expect

our respondents be frequent social media users; hence, *communicative use of social media* was also controlled. Consistent with prior research (Chen & Li, 2017), the respondents were asked to indicate the frequency with which they use social media platforms to “keep in touch with families and friends,” “meet with people sharing interests,” “stay in touch with local community,” and “contact people I wouldn’t meet otherwise” via a 7-point Likert scale (1 = never, 7 = almost always) ($M = 5.30, SD = 1.23, \alpha = 0.70$).

2.2. Analytical plan

Bivariate correlations across all variables were computed as our preliminary analyses. The results were shown in Table 1. Hierarchical regression was conducted to address H1 and H2. Hayes’ (2017) PROCESS macro model 4 was performed to examine the mediation model (H3), model 1 was applied for moderation effect (H4a and 5a), and model 14 was utilized to confirm the proposed moderated mediation model (H4b and H5b).

3. Results

H1 posited that SMIS would be positively associated with COVID-19 misperceptions. As can be seen in Table 2, beyond all controls, there is a significant, positive association between SMIS and COVID-19 misperceptions ($b = 0.16, SE = 0.05, p < .01$), lending support to H1. Further, H2 proposed that NFC would be negatively associated with COVID-19 misperceptions. As hypothesized, the regression showed a significant negative association between NFC and COVID-19 misperceptions ($b = -0.21, SE = 0.06, p < .001$). Hence, H2 is also buttressed.

H3a posited general misperceptions would mediate the association between SMIS and COVID-19 misperceptions. The results of Hayes’ (2017) PROCESS macro model 4 show that SMIS was positively associated with general misperceptions ($b = 0.10, SE = 0.41, p < .05$), and the increased general misperceptions was further associated with greater COVID-19 misperceptions ($b = 0.77, SE = 0.40, p < .001$). The 95% bootstrap confidence interval for the indirect effect based on 10,000 bootstrap samples was significant and did not cross zero, $ab = .07, Boot SE = 0.03, 95\% CI = [0.0075, 0.1414]$. Therefore, H3a is supported.

Same analysis was performed to confirm H3b. The results show that NFC was associated with lower general misperceptions ($b = -0.19, SE = 0.04, p < .001$), and the latter was associated with stronger COVID-19 misperceptions ($b = 0.76, SE = 0.04, p < .001$). The 95% bootstrap confidence interval for the indirect effect based on 10,000 bootstrap samples was significant and did not cross zero, $ab = -.14, Boot SE = 0.03, 95\% CI = [-0.2148, -0.0774]$. Therefore, general misperceptions mediated the association between NFC and COVID-19 misperceptions, lending support to H3b as well.

H4a proposed that MLOC would moderate the association between

Table 1
Bivariate correlation coefficients across all endogenous variables.

	1	2	3	4	5	6	7	8	9	10
1. Gender	–									
2. Age	-.30***	–								
3. Education	-.35***	.42***	–							
4. Income	-.44***	.65***	.67***	–						
5. Political efficacy	-.22***	.22***	.41***	.38***	–					
6. Communicative use of social media	-.17***	.16***	.25***	.28***	.32***	–				
7. Social media information seeking	.04	-.05	-.05	-.11**	-.28***	-.38***	–			
8. Need for cognition	-.16***	.32***	.32***	.24***	.38***	.18***	-.17***	–		
9. Media locus of control	-.31***	.27***	.45***	.43***	.56***	.35***	-.23***	.39***	–	
10. General misperceptions	.28***	-.20***	-.50***	-.41***	-.40***	-.22***	.15***	-.35***	-.43***	–
11. COVID-19 misperceptions	.22***	-.14***	-.34***	-.30***	-.38***	-.22***	.18***	-.31***	-.38***	.69***

Note. ** $p < .01$, *** $p < .001$.

Table 2
Regressions on general and COVID-19 misperceptions.

Variables	General misperceptions			COVID-19 misperceptions		
	<i>b</i>	<i>SE</i>	β	<i>b</i>	<i>SE</i>	β
<i>Step 1</i>						
Age	.02**	.01	.15**	.01*	.01	.09*
Gender	.09	.06	.06	.10	.07	.05
Education	-.34***	.04	-.35***	-.14	.06	-.10
Income	-.06*	.03	-.10*	-.02	.04	-.03
Political efficacy	-.28**	.03	-.21**	-.30***	.04	-.26***
Communicative social media use	-.01	.02	-.01	-.06*	.03	-.08*
ΔR^2	1.5***			.16***		
Model R^2	.15***			.16***		
<i>F</i> for R^2	5.14***			17.29***		
<i>Step 2</i>						
Age	.02**	.01	.13**	.01†	.01	.08†
Gender	.09	.06	.06	.10	.07	.05
Education	-.31***	.04	-.32***	-.12*	.06	-.09
Income	-.05†	.03	-.09†	-.02	.04	-.03
Political efficacy	-.10**	.03	-.13**	-.24***	.04	-.21***
Communicative social media use	-.01	.02	-.01	-.04	.03	-.05
SMIS	.10*	.41	.13*	.16**	.05	.11**
NFC	-.19***	.40	-.24***	-.21***	.06	-.14***
ΔR^2	.17***			.03***		
Model R^2	.01***			.19***		
<i>F</i> for R^2	26.05***			12.109***		
<i>Step 3</i>						
SMIS → General misperceptions				.07**	.03	.10**
NFC → General misperceptions				-.14*	.03	-.19*
<i>Step 4</i>						
SMIS * MLOC	-.07	.05	-.10			
NFC * MLOC	-.01	.05	.02			

Note. †*p* < .10 (marginal significance), **p* < .05, ***p* < .01, ****p* < .001.

SMIS and general misperceptions. The result of the PROCESS macro model 1 demonstrates that MLOC is not a significant moderator between SMIS and general misperceptions (*b* = −0.07, *SE* = 0.05, *p* = .11). Hence, H4a is rejected.

H4b further posited that MLOC would moderate the mediated associations between SMIS and COVID-19 misperceptions via general misperceptions. Prior to analyzing the moderated mediation models, the results of Hayes’ (2017) PROCESS macro model 14 based on 5000 bootstrap samples first exhibited a significant two-way interaction effect of general misperceptions and MLOC on COVID-19 misperceptions (*b* = −0.18, *SE* = 0.04, *p* < .001, 95% CI: [−0.2532, −0.1148]). Fig. 2 exhibits the interaction. Simple slope tests demonstrated that among those with higher MLOC, the positive association between general and COVID-19 misperceptions became weaker than those who reported lower MLOC.

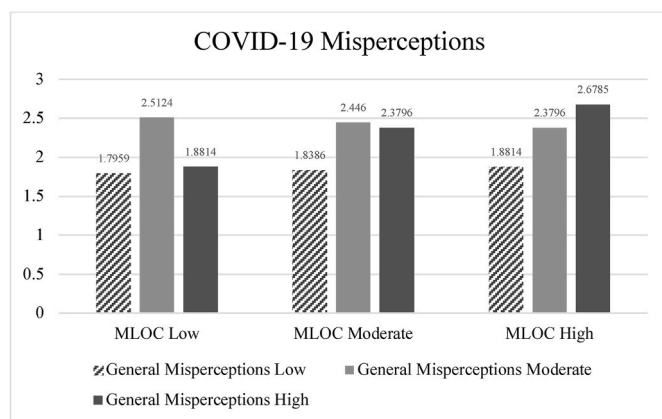


Fig. 2. Interaction between general misperceptions and MLOC on COVID-19 misperceptions.

Moreover, the result of the 95% bias-corrected confidence intervals from 5000 bootstrapped samples demonstrated that the association between SMIS and COVID-19 misperceptions mediated through general misperceptions and with the moderator of MLOC was significant (*b* = −0.02, *Boot SE* = 0.01, 95% CI = [−0.0380, −0.0021]). As can be seen in Table 3, among those who reported lower MLOC, the positive mediated association was significant and stronger (*b* = 0.08, *Boot SE* = 0.04, 95% CI = [0.0100, 0.1571]), compared with those who reported higher MLOC (*b* = 0.06, *Boot SE* = 0.03, 95% CI = [0.0071, 0.1113]). In other words, among those with higher MLOC, the positive indirect effect of SMIS on COVID-19 misperceptions were decreased, lending full support to H4a.

H5b further posited that MLOC would moderate the mediated association between NFC and COVID-19 misperceptions via general misperceptions. The results of the 95% bias-corrected confidence intervals from 5000 bootstrapped samples demonstrate that the association between NFC and COVID-19 misinformation beliefs mediated through general misinformation beliefs and with the moderator of MLOC was significant (*b* = 0.04, *Boot SE* = 0.01, 95% CI = [0.0162, 0.0619]). As exhibited in Table 4, among those who reported lower MLOC, the negative mediated association was significant and weaker (*b* = −0.16, *Boot SE* = 0.04, 95% CI = [−0.2421, −0.0829]), compared with those who reported higher MLOC (*b* = −0.11, *Boot SE* = 0.03, 95% CI = [−0.1708, −0.0580]). In other words, MLOC and NFC can interact to decrease COVID-19-related misperception. Hence, H4b was also fully supported.

4. Discussion

Heeding the call to curb the prevalence of misinformation during the COVID-19 pandemic, this study examined the conditional indirect effects of social media information-seeking and need for cognition on COVID-19 misperceptions in China, based on a moderated mediation model. Several findings warrant in-depth discussions.

First, it is consistent with prior literature that social media information-seeking was positively associated with COVID-19 misperceptions (e.g., Allington et al., 2021; Enders et al., 2021; Su, 2021). Prior studies found that people with higher misperceptions regarding vaccines and preventive measurements most frequently consumed news information through social media platforms rather than traditional outlets (e.g., Corwin, 2020; Larson, 2018; Massey et al., 2020). In addition to its ease of use and fragmented agenda-setting ability (Vargo et al., 2018), this could also be premised on social media’s (1) absence of institutional gatekeeper and (2) inadequacy of fact-checking mechanism implementation (Andersen & Søre, 2020). Unlike traditional media, where editors, fact-checkers, and sponsors are all committed to gate-keeping the content creation and circulation, the low threshold of information production and distribution on social media have rendered these platforms as a fertile breeding ground upon which misinformation could circulate easily rampantly (Chou et al., 2018).

Although some would argue that these characteristics of social media

Table 3
Moderated mediation effect of social media information seeking on COVID-19 misperceptions.

Moderator value	Conditional indirect effect at means and ±1SD			
	Effect	Boot <i>SE</i>	Boot LLCI	Boot ULCI
Low MLOC, − 1 SD	.0827	.0371	.0100	.1571
Moderate MLOC	.0707	.0315	.0086	.1333
High MLOC, + 1 SD	.0588	.0262	.0071	.1113

Note. LLCI: lower limit confidence interval; ULCI: upper limit confidence interval.

H5a posited that MLOC would be a significant moderator between NFC and general misperceptions. The result of the PROCESS macro model 1 suggests that MLOC is not a significant moderator between NFC and general misperceptions (*b* = 0.01, *SE* = 0.05, *p* = .85). Hence, H5a is rejected.

Table 4
Moderated mediation effect of NFC on COVID-19 misperceptions.

Moderator value	Conditional indirect effect at means and $\pm 1SD$			
	Effect	Boot SE	Boot LLCI	Boot ULCI
Low MLOC, - 1 SD	-.1613	.0403	-.2421	-.0829
Moderate MLOC	-.1372	.0340	-.2050	-.0705
High MLOC, + 1 SD	-.1131	.0284	-.1708	-.0580

Note. LLCI: lower limit confidence interval; ULCI: upper limit confidence interval.

have exactly allowed free flow of information, contributing to a free marketplace of ideas (Loader & Mercea, 2011), researchers have argued that an ideal public sphere cannot be true until the information is authentic and verifiable. Differently put, the maturity of a deliberative democracy hinges on authentic information; the free flow of false information would not only be inconducive to deliberative democracy but also erode the existing bedrock of information democratization (Morgan, 2018; Su, 2021).

In the case where the institutionalization and normalization of fact-checking mechanisms are still facing a series of obstacles (Andersen & S oe, 2020; Brandtzaeg et al., 2018; Shin & Thorson, 2017), scholars argued that individuals' media literacy can serve as an effective, internal cognitive shield to protect people against misinformation (Vraga & Tully, 2021; Xiao, Borah, & Su, 2021). Echoed with these arguments, our findings suggested that NFC, one important dimension of media literacy, was negatively associated with misperceptions about COVID-19, indicating that those favoring effortful cognitive activities, rather than mindlessly processing information, are typically less likely to fall for misinformation.

Meanwhile, individuals' pre-existing beliefs in some general conspiracy theories have been found to play a significant mediating role, leading to a higher likelihood of COVID-19-specific misperceptions. This finding is also congruent with prior literature. Previous research showed that social media use increases conspiracy theory endorsement revolving various issues and in various contexts (Borah et al., 2021; Corwin, 2020), whilst need for cognition decreases such endorsement (Su et al., 2021). Then, individuals' tendencies of conspiracy theory endorsement are also overarching, in a way that their ideation leading to misperceptions is across disparate topics of misinformation (e.g., Lewandowsky et al., 2013; Swami et al., 2009). Moreover, scholars found that pre-existing misperceptions about general issues can be an accelerator of issue-specific misperceptions and can decrease the effects of corrective messages (e.g., Nyhan & Reifler, 2015). This is because a greater likelihood of general misperceptions signals a high extent of an individual's conspiracist tendency, in other words, some are more likely to endorse misinformation and conspiracy theories than others (see Douglas et al., 2016). Therefore, their misperceptions revolving around the COVID-19 pandemic could be a manifestation or an extension of its pre-existing conspiracy tendencies.

Lastly, we found that MLOC was a significant moderator, upon which people's misperceptions about COVID-19 are contingent. Specifically, we found that among those with lower self-perception of media control, seeking information via social media was associated with greater misperceptions, compared to those with higher MLOC. Meanwhile, MLOC and NFC, as two dimensions of media literacy, were also found to have a significant interaction effect on COVID-19 misperception reduction, namely, the negative relationship between NFC and misperceptions has become more negative among those who have higher MLOC. This finding is as expected in that individuals' MLOC denotes their abilities to curate and control, by themselves, the information feeds to consume. To be specific, if an individual has greater locus of control over the media they use, they would be more likely to take active measures to avoid the content they dislike (Walsh, 2010) and to "avoid being misinformed by paying attention to different sources of news" (Murrock et al., 2018, p. 56).

5. Conclusion and implications

Initially, our study revealed that social media information-seeking is positively associated with COVID-19 misperceptions among Chinese people. Moreover, general misperceptions regarding some well-known conspiracy theories were found to play a mediating role in shaping the above associations. In conceptual terms, first, this finding validated and extended the understandings of the role social media information-seeking plays in facilitating misperceptions (Chou et al., 2018). Second, the significant mediating role of general misperceptions implied that individuals' proclivity to endorse conspiracy theories is not confined to one singular topic of misinformation, but across disparate topics of misinformation (Goertzel, 1994; Lewandowsky et al., 2013; Swami et al., 2009). Thus, conspiracist tendency and issue-specific misperceptions can also go hand-in-hand (Nyhan & Reifler, 2015).

We also found that NFC is negatively associated with COVID-19 misperceptions, wherein MLOC is a significant moderator. Conceptually, these findings demonstrated the values of different dimensions of media literacy in curbing misinformation and the subsequent infodemic. Further, although scholars have already indicated the few sub-domains of media literacy and their nuances (Ashley et al., 2017; Maksl et al., 2015; Vraga et al., 2015), media literacy has still largely been treated as a whole in prior literature, measured by a total-scale. Our attempt, however, detected NFC and MLOC separately, and exhibited their distinct roles in linking with misperceptions.

More importantly, our incorporation of SMIS suggested that the formation of perception or action is influenced not only by one's psychological factors, but also the information environment s/he is exposed to. Moreover, not akin to traditional path models in health communication such as the HBM (Hochbaum, 1958), while our examination of MLOC as the moderator implies that the proposed effects can vary across people with different extents of self-perceptions about the environmental control abilities.

In addition to the theoretical contribution, our study also has practical implications. The first pertains to the information sources one uses to consume news. Many scholars have highlighted the significance of diversifying the partisanship of information sources in avoiding echo chamber and information cocoons (e.g., Garrett, 2017), while what is of similar significance is the pluralism of the typologies of media platforms used. Although social media have irreplaceable grips in information distribution and have contributed uniquely to the information democratization, traditional media sources should also be taken into account to guarantee that credible, gatekept information also has a chance to appear in one's feed. This would possibly be an effective remedy and correction to the overabundant and bewildering information in social media platforms.

Second, as NFC and MLOC were both found to decrease misperceptions, media literacy education and campaigns are imminent. If institutionalized fact-checking strategies are far from adequate and satisfactory, one's knowledge structure (Ashley et al., 2017), ability of rationally and critically processing information (Austin et al., 2016), and self-efficacy in controlling the information environment they are in (Maksl et al., 2015), would be "protective shields that assist individuals to navigate through the complex digital environment" (Xiao, Borah, & Su, 2021, p. 10). Hence, we recommend that media practitioners, scholars, and educators attach more significance to media literacy, through either initiating media literacy campaigns or enriching the extant curricula, to equip media consumers and youngsters with important skillsets in identifying and combating misinformation.

6. Limitations and future directions

This study is not without limitations. First, we used a convenient sample. Although a plethora of studies has relied on convenient samples and used purposive sampling strategies, future scholars could benefit from analyzing national samples, if possible, to generate more

representative findings. Moreover, the data analyzed is cross-sectional, which potentially prohibited us from inferring causative effects. Future scholars should endeavor to use panel data to gauge changes over time. Additionally, our investigation was based on path analysis, which did not take into consideration latent variables. Future scholars can also consider using structural equation modeling along with latent variables to gauge causative relationships across variables. Furthermore, as reviewed earlier, media literacy consists of three dimensions, while we only included two (i.e., NFC and MLOC) in our model and did not examine knowledge structure. This was because China's media landscape and their operating systems are unique, hence, the existing measurement of media knowledge structure can hardly adapt to the Chinese participants. However, given media knowledge structure is an important component of the larger domain of media literacy, future scholars should still examine it in various research contexts.

Credit author statement

Yan Su: Conceptualization, Methodology, Data collection, Data analysis, Writing – Original draft preparation. **Danielle Ka Lai Lee:** conceptualization. **Xizhu Xiao:** conceptualization.

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