Associations between COVID-19 information acquisition and vaccination intention: The roles of anticipated regret and collective responsibility

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Abstract

While public health communication has been suggested to be a key for improving acceptance of COVID-19 vaccination, this study tested mediation pathways through which three types of vaccine information acquisition, i.e., seeking, scanning, and discussing, affect COVID-19 vaccination intention. The pathways comprise two mediators, i.e., anticipated regret due to inaction and collective responsibility. Results suggest that information seeking and discussing may have encouraged the intention to get vaccinated, but mainly indirectly through the two mediators. Information seeking and discussing may have elicited anticipated regret and collective responsibility, which in turn increased vaccination intention. The paths from information scanning were smaller in effect sizes and statistically unacknowledged. Implications and limitations are discussed.

Keywords: COVID-19 vaccine information, information acquisition, anticipated regret, collective responsibility, vaccination intention

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Introduction

While coronavirus disease-19 (COVID-19) continues to be a major cause of rising death tolls and threat to public health, and the medical community recommends vaccination as one of the most effective countermeasures, vaccination intention remains low in many countries. A large proportion of many populations chose to delay or even refuse immunizations. Due to the highly contagious nature of the virus, vaccine hesitancy and refusal can pose substantial risks to the wider community. Improving COVID-19 vaccine uptake becomes challenging for China – the most populous country in the world. Public health experts suggested that emphasis should be on improving communication, educating the public, and creating strategies for vaccine acceptance among society (Agrawal et al., 2020).

Governors worldwide have relied on both online and offline news media to disseminate COVID-19 related information and instructions for public health education. As such, people are exposed to a wealth of COVID-19 information that may impact their subsequent decisions regarding COVID-19 prevention and protection (Gunderson et al., 2021). For instance, Liu (2020) found that COVID-19 information exposure on digital media, such as social media and online news media, was crucial in promoting preventive behaviors. The proliferation of COVID-19 vaccine information on the traditional mass media (e.g., newspaper, radio, and television), combined with the rise of information available via social media and other online sources, has expanded the potential for widespread exposure to COVID-19 vaccine-related information. This potential underscores the need to understand how people get access to and process COVID-19 vaccine information to make vaccination decisions.

Of particular interest to this study is the affective-cognitive process through which COVID-19 vaccine information exerts an influence on vaccination intention. The integration of the regret theory (Janis and Mann, 1977) and the cognitive-functional model (CFM) (Nabi,

2002) provides a proper framework for understanding the affective-cognitive process between information acquisition and vaccination intention. The CFM postulates that messages can evoke an emotion if the content reflects emotion's core relational theme, and that elicited emotion would affect individuals' attitude or judgment, and result in desired behaviors (Nabi, 2002; Nabi, 1999). In the face of the COVID-19 pandemic, individuals evaluate the risk in two ways: one is the intuitive-experiential system that is affective and emotionally driven and the other is the analytical-rational system that is logical and deliberate (Epstein et al., 1996; Evans, 2010; Slovic et al., 2004). As people receive more COVID-19 related information, anticipated vaccine-refusal regret might arise when the environment is perceived to contain the COVID-19 threat to health and the vaccines are considered effective against COVID-19 infection. As a typical emotional response to risk, anticipated regret impacts cognitive evaluation of uncertain situations (Nabi, 2002), and influences people's attribution of the responsibility that subsequently determines their behavioral outcomes (Feigenson & Park, 2006). This is because, in collectivistic countries, including China, where individuals adopt a collectivistic mindset and care more for the greater good, a cognitive sense of collective responsibility to overcome the pandemic is easier to be evoked when people were exposed to COVID-19 related information (Lu et al., 2021; Maaravi et al., 2021). Particularly, the success of a mass vaccination program depends on collective efforts and a high acceptance of the vaccine for risk reduction. It is likely that, in collectivistic societies, COVID-19 vaccine information-informed individuals, who perceive higher levels of anticipated inaction regret, are more likely to have a strong belief in the collective responsibility to contain the spread of COVID-19 infections.

Setting in the Chinese context, this study thus examined relationships between COVID-19 information acquisition, anticipated regret, collective responsibility, and vaccination intention, being the first attempt made so far in this direction. The purpose of this

study is to (1) investigate different types of COVID-19 information acquisition behavior (e.g., seeking, scanning, and discussing) and their influence on vaccination intention; (2) signify how different information acquisition behaviors are associated with anticipated regret and collective responsibility, and how anticipated regret and collective responsibility influence individuals' vaccination intention; and (3) examine the mediating roles of anticipated regret and collective responsibility.

Theoretical framework

The role of emotion and cognition in information processing has been an important line of inquiry within the domain of media effects, holding promise for research in communication and public health. To understand the relationship between COVID-19 vaccine information acquisition and vaccination intention, it requires a solid conceptual understanding of what emotion is elicited, how vaccine-related cognition is formed, and how such a construct might play a role in the information processing, from information scanning, seeking and discussing, to behavioral intention. In the current study, we explored the anticipated regret as an affective reaction of COVID vaccine information acquisition, investigated the perception of collective responsibility to get vaccinated as a cognitive response toward COVID-19 vaccine information processing, and examined their subsequent effects on vaccination intention.

The conceptualization of this study is based on an integration of the regret theory (Janis &Mann, 1977; Zeelenberg, 1999) and the cognitive-functional model (CFM) (Nabi, 2002). Regret has been defined as a counterfactual emotion (Kahneman & Miller, 1986), which occurs in response to "the difference between the actual outcome of the chosen option and the highest possible outcome of the rejected options" (Zeelenberg, 1999, pp.94). The regret theory, developed from the expected utility theory, posits that the expected utility of an option depends on the calculus of gain and loss associated with the outcomes of that option (Zeelenberg, 1999). According to the theory, people sometimes base their decisions on a

'minimax regret' principle. This principle maintains that individuals calculate the maximum of possible regret for each option, and they are likely to select the one with minimax regret. In other words, people compare the consequences of the selected alternative to the unselected alternative, and anticipated regret arises when the outcome of the rejected option would have been better (Zeelenberg, 1999). Regret scholars also assume that people would take into account anticipated emotions to possible outcomes when making decisions (Bell, 1982; Brewer et al., 2016; Hetts et al., 2000; Loomes & Sugden, 1982; Zeelenberg, 1999). For instance, Brewer and colleagues (2016) conducted a meta-analysis study and found that anticipated inaction regret is vital in the domain of health and has reliable associations with a broad array of behavioral intentions and health behaviors, such as HPV vaccination intention and cancer screening practices.

The CFM is grounded in both functional emotion theories (e.g., Leventhal, 1970; Loewenstein et al., 2001) and dual-process models of persuasion (e.g., Xu, 2017), which maintains that media consumption can evoke emotional responses that are related to the theme of the message when receivers recognized personal relevance (Nabi, 2002). The elicited emotion reflects the person-environment relationship that individuals were involved and determines the subsequent behaviors. Nabi (1999; 2002) further postulated that emotion is associated with two typical simultaneous motivations. One is motivated attention (or avoidance) that indicates the levels of cognitive engagement in the message topic and content, and another one is a behavioral motivation to achieve the goal activated by the emotion. For instance, anticipated regret arises when people are exposed to information about the risks and health consequences of COVID-19 infection, and information regarding the COVID-19 vaccine effectiveness and efficacy, thus creating a collective sense of responsibility and motivating protective behaviors. Therefore, the CFM can help explain the causal order of steps in the information processing: attention to the event (e.g., COVID-19

vaccine information scanning, seeking and discussing) leads to emotional responses (e.g., anticipated inaction regret), which leads to the development of the event-related cognition and judgment (e.g., collective responsibility) and influences individuals' decision making (e.g., vaccination intention). Based on this theoretical foundation, we describe our model in the following sections.

Three types of information acquisition

Information seeking, information scanning, and information discussing are three typical ways that individuals obtain health-related information (Ford & Kaphingst, 2009; Longo, 2005; Niederdeppe et al., 2007; Shim et al., 2006). *Information seeking* is an active information acquisition behavior that individuals deliberately search for additional information in response to a relevant event, such as a cancer diagnosis and a pandemic outbreak (Niederdeppe et al., 2007; Shim et al., 2006). In general, information seeking emphasizes the one-way seeking behavior from selected information carriers with limited interactions or information exchange (Magnezi et al., 2015). Information carriers broadly include media channels such as newspapers, television, radio, and the Internet (Anker et al., 2011). Examples of COVID-19 vaccine information seeking behavior include active efforts to obtain COVID-19 vaccine information through social media or with the help of search engines on the Internet.

Individuals are not always active health information seekers, and much of the information people are exposed to is encountered through less effortful ways. The critical difference between information seeking and scanning is the level of activeness and efforts in obtaining the information (Niederdeppe et al., 2007; Shim et al., 2006). *Information scanning* refers to "the information acquisition that occurs within routine patterns of exposure to mediated and interpersonal sources that can be recalled with a minimal prompt" (Niederdeppe et al., 2007, pp. 154). This process occurs when individuals come across the

information accidentally in a daily routine. The information scanning perspective indicated that when information flow by, people tend to have certain levels of foundational knowledge and interest to produce attention and retention (Hornik & Niederdeppe, 2008). Examples of information scanning include paying attention to COVID-19 vaccine information while watching a regular TV news report, or obtaining the vaccine information while browsing the Facebook posts.

Information discussing depicted that people discuss and exchange information with family, friends, coworkers, and other interpersonal relations (Jones et al., 2007). Despite that interpersonal relations are salient sources from which individuals seek or scan information, information discussing emphasizes the two-way and interactive information acquisition process (Liu & Jiang, 2019). Examples of COVID-19 vaccine information discussing include exchanging information regarding the vaccine necessity with family, and sharing opinions on online communities on whether or not to get vaccinated.

Information acquisition and anticipated regret

The clinical spectrum of COVID-19 infection ranges from asymptomatic infection to life-threatening syndrome and even fatal outcomes (Tankisi et al., 2020; Rio et al., 2020). Long-term clinical consequences such as fatigue, mental health disturbances, organ dysfunction (e.g., brain, lungs, and heart), and dyspnea have also been documented (Rio et al., 2020; Zuin, et al., 2021). In the early stage of the COVID-19 outbreak, information about these severe clinical consequences of COVID-19 infection has been disseminated to the public so that people can take necessary precautions. Besides, COVID-19 infections and deaths statistics were updated throughout each day. Individuals repeatedly exposed to this information would develop a sense of threat and urgency (Nazione et al., 2020). Along with the development and distribution of COVID-19 vaccines, information about the effectiveness of COVID-19 vaccines and the benefits of getting vaccinated has been communicated to

prompt vaccination behaviors (Schiavo, 2020). For instance, scientific evidence has supported that vaccines not only prevent COVID-19 infection but also reduce the severity of symptoms and risk of death (Lipsitch & Dean, 2020). In addition to these, China implements a strict 'zero-COVID' policy that individuals with suspected or confirmed COVID-19 and their close contacts will be quarantined (Su, 2021). As such, people in China are more anxious about being infected with COVID-19. Information on the mass media can not only increase one's understanding with respect to the severity of COVID-19 infection but also improve their knowledge about how to prevent hospitalization due to COVID-19.

Empirical evidence from the sociopsychological domain has supported that health and risk information can evoke anticipated regret that is positively related to health persuasion and health behavior change (Carfora et al., 2017; Kim, 2020; Smerecnik & Ruiter, 2010). For instance, Smerecnik and Ruiter (2010) conducted an experimental study to examine how different HIV information intervention strategies influence people's motivation for condom use and found that fear appeal messages would elicit anticipated regret, which, in turn, increased the intention to use condoms. Active information seekers who took the initiative to search for COVID-19 vaccine-related information are likely to be health-oriented (Liu, 2021), and there is a reason to believe that as they better understand the severe clinical and social consequences of COVID-19 infection and the benefits of COVID-19 vaccination in combating the disease, they would be more likely to experience anticipated inaction regret since the pandemic is still rampaging worldwide.

Given that information scanning is the most prevalent way that people receive health information (Hornik et al., 2013; Shim et al., 2006), it can also predict anticipated regret for not getting the COVID-19 vaccine. During the COVID-19 outbreak, information scanning increases the probability of exposure to and recall of COVID-19 vaccine information (Hornik et al., 2013; Hornik & Niederdeppe, 2008; Shim et al., 2006). Vaccine information attended

to during routine scanning may describe COVID-19 associated risks and immunization benefits, the support of specific authorities for the vaccination program, and instructions for successfully executing the immunization behavior. Repeated exposure to these messages can elicit anticipated inaction regret and make the reasons for COVID-19 vaccination more cognitively accessible as people better understand the negative and long-term health effects of COVID-19.

Information discussing, another way that people obtain COVID-19 vaccine-related information within interactive communications, is in parallel to emotional and instrumental support for COVID-19 vaccination (Rains, 2007). Research has suggested that information discussing with family and friends was more influential that determines ones' emotional, attitudinal, and behavioral responses (Ford & Kaphingst, 2009). Individuals in a collectivistic society privilege family and communities over individuals and they often discuss and exchange COVID-19 information to make sure that people they care about are aware of the risk and practice preventive behaviors (Liu, 2021). Liu and Jiang (2019) conducted a five-year comparative study in China and found that patients who discussed health information with family and friends were more likely to engage in healthcare decision-making processes. Ford and Kaphingst (2009) found that the more people discussed health problems with family and friends the more likely they would believe that cancer can be prevented. Therefore, it is reasonable to believe that COVID-19 vaccine information discussing would also increase anticipated inaction regret. This is because the interactive communication process through which COVID-19 information was exchanged can prompt one to be more concerned about the health consequences of not getting COVID-19 vaccines that pose risks to people around. Based on the above, the first hypothesis was proposed:

H1: COVID-19 vaccine information (1) seeking, (2) scanning, and (3) discussing will be positively associated with the anticipated regret of not getting COVID-19 vaccines.

Information acquisition and collective responsibility

Collective responsibility in health care refers to a cognitive judgment that addresses widespread harm and wrongdoing associated with the actions of groups and postulates that individual members of the society bear a responsibility to change attitudes and behaviors that may endanger the public's health (Marks et al., 1999; Newton, 1982). In the face of the COVID-19 pandemic that poses communal risks to the entire society, collective responsibility is advocated for the reason that unvaccinated people present a risk to the community – including those who are too young to be vaccinated, persons who cannot be vaccinated due to medical reasons (e.g., severe allergic reactions), and people who cannot produce an adequate immune response to vaccination (Salmon & Omer, 2006). Liu (2021) argued that confronting the COVID-19 pandemic, individual effort to fight against the disease is not independent of the collective system. This is particularly true in a collectivistic society where collective responsibility is emphasized and people are encouraged to coordinate their actions to stop the spread of COVID-19 (Kwok et al., 2021).

In China, mass media and the Internet are under the strict control of the party-state (Yang, 2013). COVID-19 vaccine-related information is mostly framed emphasizing the governmental and social efforts in developing COVID-19 vaccines, the safety and efficacy of the vaccines, collective efforts were essential for defeating the pandemic, and members of the society should fulfill the obligations of their social roles to maintain social harmony and prioritize public interests. As people seek more COVID-19 vaccine-related information from various media sources, they develop a strong belief in both individual and collective responsibility to control the spread of COVID-19 (Liu, 2021). The cognitive belief in collective responsibility is strengthened since COVID-19 vaccine information appears repeatedly across a range of media. Knowing the unprecedented global efforts and advances in developing COVID-19 vaccines and that a vaccination program works only if a large

number of people at one or more locations get vaccinated in a short interval of time (Asgary et al., 2020), information receivers would be embroiled in an atmosphere that most others engage in the vaccination behavior and that the behavior is expected (Hornik et al., 2013). COVID-19 vaccine information discussing is associated with the perception of collective responsibility because, in the face of a life-threatening pandemic, discussing vaccine information with family, friends and other peers would increase the sense of collective belongingness and motivate one to make rational decisions that are in accordance with collective interest (Ford & Kaphingst, 2009). Based on the above, the second hypothesis was proposed:

H2: COVID-19 vaccine information (1) seeking, (2) scanning, and (3) discussing will be positively associated with the perception of collective responsibility.

Anticipated regret, collective responsibility, and vaccine intention

Anticipated regret following information acquisition can influence cognition and behaviors. Research in health behaviors, persuasion, and communication has seized on anticipated regret as novel risk appraisal closely associated with decision-making in health (Brewer et al., 2016; Hetts et al., 2000; Penţa et al., 2020). When anticipating potential counterfactuals in the aftermath of a negative event, a person is likely to be prompted to engage in desired behaviors to minimize the possibility of experiencing regret over the outcome (Hetts et al., 2000; Penţa et al., 2020). For instance, drawing upon the work of Janis and Mann (1977), Richard et al. (1995; 1998) added anticipated regret to the theory of planned behavior to investigate precautionary sexual behaviors and found that anticipated regret can be a powerful factor that helps reduce risky sexual behaviors. A recent meta-analysis study investigating the relationship between anticipated regret and behavioral intentions or health behaviors confirmed that anticipated regret was associated with both intentions and health behaviors (e.g., cancer screening and healthy eating behaviors) (Brewer et al., 2016). Given

that COVID-19 is a life-threatening disease, uncertainty about a possible infection is also likely to cause anticipated regret related to the uncertainty which, in turn, motivates people to engage in protective behaviors. Following this line, anticipated regret is likely to result in a higher level of COVID-19 vaccination intention. Thus, one hypothesis is put forth:

H3: Anticipated regret will be positively associated with COVID-19 vaccination intention.

According to the CFM (Nabi, 2002), a typical emotion aroused by media messages can reflect a unique person-environment relationship that impacts one's cognitive understanding of the goals associated with the emotion and determines their decision-making. Emotions arise from subcortical brain regions, which are inextricably linked to the human body. As such, emotions come first in development before cognition and may permeate cognitive processing and decision-making (Sayegh et al., 2004). The persuasive effect of vaccine information depends on the emotion evoked, which can influence one's social judgment regarding the responsibility to control and prevent the spread of COVID-19. Anticipated regret is contingent on the situation assessment of the pandemic framed on the media, which influences cognitive appraisals, which in turn influence the attribution of responsibility. This view is consistent with the strong association found between emotions and attribution of responsibility (Feigenson & Park, 2006; Cheng & Lin, 2016). Feigenson and Park (2006) extended the original attribution theory by considering the role of emotions in the association between media and attribution of responsibility. Specifically, emotions aroused by certain information is a key psychological mechanism catalyzing the influence of information on the attribution of responsibility. For example, a review study of emotions and attribution of legal responsibility and blame supported that people's emotions (e.g., anxiety and regret) following information exposure affect the type of processing in which they engage when careful information elaboration leads to judgments of responsibility (Feigenson

& Park, 2006). When one experiences a typical emotion, it becomes easier to access the cognitive structure of that emotion, which would be likely to be utilized in subsequent social judgments and social behaviors (Bower & Forgas, 2001).

The emotional progress of regret involves one's self-reflection, rumination, encouragement, or blame (Cheng & Lin, 2016). People who experienced anticipated regret on COVID-19 vaccination would be more likely to perceive higher levels of collective responsibility because of the cognitive structure of anticipated regret they experience (e.g., "being severely ill due to COVID-19 infection and posing the risk of COVID-19 to family and friends") makes salient the role of collective efforts as a solution to fight against COVID-19 pandemic. Subsequently, an increased perception of collective responsibility would further motivate people to engage in preventive behaviors (Marks et al., 1999). In the early stages of the COVID-19 pandemic, deliberate efforts to promote collective responsibility in joint action (e.g., wearing facial masks and avoiding mass gatherings) have been part of media campaigns, and have achieved some results in China (Min et al., 2020). As such, the increased perception of collective responsibility about vaccination would promote COVID-19 vaccination intention. The following hypotheses are advanced:

H4: Anticipated regret will be positively associated with collective responsibility.

H5: Collective responsibility will be positively associated with COVID-19 vaccination intention.

Based on the above literature review, this study also tested a multiple-mediator model in which COVID-19 vaccine information acquisition behaviors have an indirect relationship with vaccination intention through anticipated regret and collective responsibility (see Figure 1). That is, COVID-19 vaccine information seeking, scanning, and discussing would increase anticipated regret and collective responsibility, which in turn give rise to COVID-19 vaccination intentions. Besides, we also examined a serial mediation that placed anticipated

regret and collective responsibility as serial mediators in the relationship between COVID-19 vaccine information acquisition and vaccine intention. Therefore, we proposed the following hypotheses:

H6: The relationship between COVID-19 vaccine information (1) seeking, (2) scanning, (3) discussing and vaccination intention will be mediated through anticipated regret.

H7: The relationship between COVID-19 vaccine information (1) seeking, (2) scanning, (3) discussing and vaccination intention will be mediated through collective responsibility.

H8: The relationship between COVID-19 vaccine information (1) seeking, (2) scanning, (3) discussing and vaccination intention will be mediated through anticipated regret and collective responsibility in sequence.

[Insert Figure 1 here]

Method

Participants and Procedure

Upon Institutional Review Board approval, data were collected in December 2020. An online survey company in China recruited participants. Participants were assured of the confidentiality of their information and were informed that the participation was anonymous and voluntary. The survey includes questions for demographic information, COVID-19 vaccine-related information seeking, scanning, discussing, anticipated regret, collective responsibility, and COVID-19 vaccination intention. A total of 438 respondents completed the survey. The participants were between 18 and 60 years old (M = 30.69, SD = 9.68). Male and female respondents comprised 42.2% (n = 185) and 57.8% (n = 253) of the sample, respectively. The majority of respondents were highly educated with 84.3% of the sample

having a bachelor's degree or higher education. For the monthly income, more than half of the respondents (61.6%) had a monthly income above 6,000 Chinese Yuan (CNY).

Measures

Information seeking was measured by three items derived from previous research (Sun et al., 2021). Respondents were asked if they have ever searched for COVID-19 vaccine-related information from [media source] on their initiative. Three typical media sources include social media (e.g., Weibo and WeChat), online news media, and traditional news media (e.g., newspaper and radio). Respondents were asked to answer the questions regarding each media source on a five-point Likert scale (1 = never, 5 = always), and the answers were averaged to create a scale (M = 2.71, SD = 1.41, Cronbach's alpha = .93).

Information scanning was also measured by using three items adapted from Liu and Jiang (2019): "In the past three months, have you encountered COVID-19 vaccine-related information from [media source]?" Three types of media source include social media, online news media, and traditional news media. A five-point scale was used (1 = never, 5 = always). Responses of the three questions were averaged with a high score representing a higher level of information scanning (M = 3.53, SD = 1.08, Cronbach's alpha = .86).

Information discussing was measured using a single question (Liu & Jiang, 2019). Respondents were asked to rate the frequency of discussing COVID-19 vaccine-related information or topics with their family members, friends, and coworkers in the past three months. A five-point scale was used (1 = never, 5 = always) (M = 3.50, SD = 1.18).

Anticipated regret was measured using an item adapted from previous research (Penţa et al., 2020), on a five-point Likert scale ranging from 1 (*not at all*) to 5 (*very much*). Respondents were asked: "If you became infected with the COVID-19, how much would you regret not getting the vaccine?" A higher score represented a higher level of anticipated inaction regret (M = 4.46, SD = .89).

Collective responsibility was measured by three items using a five-point scale (1 = strongly disagree, 5 = strongly agree) (Betsch et al., 2018). Sample items include: "I get vaccinated because I can also protect people with a weaker immune system", and "Vaccination is a collective action to prevent the spread of diseases". A composite variable was computed by averaging the three items (M = 3.61, SD = .78, Cronbach's alpha = .67).

Vaccination intention was measured using three items derived from Britt et al. (2014). Respondents were asked to indicate to what extent they agree with three statements on a five-point scale where 1 meant "strongly disagree" and 5 meant "strongly agree". Sample items include: "I intend to get the COVID-19 vaccine in the next three months", "I plan to get the COVID-19 vaccine in the next three months", and "I want to get the COVID-19 vaccine in the next three months". Responses were averaged to create an index of vaccination intention (M = 3.84, SD = .94, Cronbach's alpha = .96).

Control variables include age, gender (1 = male, 0 = female), education (1 = middle school or below, 5 = postgraduate or above), monthly income, and risk perception (1 = not at all, 5 = very much).

Data Analysis

R version 1.1.463 was used for the data analysis. First, descriptive statistics of the focal variables were reported. Second, bivariate Pearson correlation was conducted to illustrate bivariate relationships between COVID-19 vaccine information seeking, scanning, discussing, anticipated regret, collective responsibility, and vaccination intention. Third, we performed a confirmed factor analysis (CFAs) to assess the constructs' reliability and validity of information acquisition. Fourth, the mediation model was tested using structural equation modeling. A model is considered tenable when it achieved CFI ≥ .95, TLI ≥.95, SRMR ≤ .10, and RMSEA ≤ .06 (Hu & Bentler, 1999). Fifth, two alternative models were proposed for comparison to see whether our research model is a good representation of the data. Two

model fit indices – Akaike's Information Criteria (AIC) and Bayesian Information Criteria (BIC) – were used for the comparative evaluation. As prior research suggested, the lower the AIC and BIC values, the better the model is (Burnham & Anderson, 2004).

Results

The means, standard deviations, and zero-order correlations of the main variables are displayed in Table 1. For COVID-19 vaccine information acquisition, a three-factor model was designed. We correlated error terms of the same latent variables following the modification indices (Brown & Moore, 2012). The results indicated that the model fits the data well with model fit indices within an acceptable range: $\chi^2\ df\ (5, N = 438) = 15.870$, $p = .007$, CFI = .996, RMSEA = .06, SRMR = .015. and TLI = .983.

[Insert Table 1 and Figure 2 here]

Regarding the proposed model of this study, the results indicated that the model adequately fit the data: $\chi^2\ df\ (5, N = 438) = 13.409$, $p = .020$, CFI = .994, RMSEA = .06, SRMR = .002, and TLI = .953. For the model comparison, the hypothesized research model generated AIC = 6327 and BIC = 6514. The first alternative model examined anticipated regret and collective responsibility as two parallel mediators and generated AIC = 6353, BIC = 6572. The second alternated model examined a serial mediation effect with collective responsibility prior to anticipated regret and generated AIC = 6398, BIC = 6632. Therefore, the hypothesized model provided a better and more parsimonious fit to the data.

Hypothesis 1 predicted that information acquisition will be positively associated with anticipated regret. Of the three indicators of acquisition, information seeking was indeed positively associated with anticipated regret ($\beta = .14$, $p < .01$), and so was information discussing ($\beta = .17$, $p < .001$), as shown in Figure 3. Information scanning, however, was statistically unacknowledged ($p \geq .05$. See Editorial, 2019; Liu et al., 2021 and Wasserstein et

al., 2016 for recommendations and practices regarding statistical *significance* v.s. *acknowledgement*). H1 was therefore partially supported.

[Insert Figure 3 here]

Hypothesis 2 predicted that information acquisition will be positively associated with the perception of collective responsibility. Figure 3 shows that only information seeking was statistically related to increased collective responsibility ($\beta = .09$, $p < .05$). H2 was partially supported.

Figure 3 also shows positive relationships between anticipated regret and vaccination intention ($\beta = .16$, $p < .001$), between anticipated regret and collective responsibility ($\beta = .19$, $p < .001$), and between collective responsibility and COVID-19 vaccination intention ($\beta = .67$, $p < .001$), lending support to H3, H4 and H5.

Hypothesis 6 postulated the effects of anticipated regret in mediating the relationship between information acquisition and vaccination intention. As depicted in Table 2, anticipated regret indeed mediated the relation between information discussing, one of the three acquisition indicators, and vaccination intention ($\beta = .03$, $p < .05$), whereas the counterpart effects failed to pass the statistical threshold of $p \geq .05$ for the other two acquisition indicators, i.e., information seeking and scanning. As such, hypothesis 6 was partially supported.

Hypothesis 7 predicted the mediation effect of collective responsibility in the relationship between information acquisition and vaccination intention. Table 2 shows that information seeking was positively related to vaccination intention via collective responsibility ($\beta = .05$, $p < .05$). The parallel mediation effects, however, were statistically unacknowledged ($p \geq .05$) for information scanning and discussing. Hypothesis 7 was partially supported.

Hypothesis 8 predicted that COVID-19 information acquisition will be related to vaccination intention through the serial mediation of anticipated regret and collective responsibility. Results in Table 2 also partially support this hypothesis. Vaccine information seeking (β = .02, p < .05) and discussing (β = .02, p < .01) were positively associated with vaccination intention through serial mediation of anticipated regret and collective responsibility. Nevertheless, the counterpart serial mediation initiated from information scanning failed to pass the statistical threshold test ($p \geq .05$).

Discussion

The current study contributes by applying the regret theory and CFM in examining the relationships between COVID-19 vaccine information acquisition, anticipated regret, perception of collective responsibility, and vaccination intention. Overall, the results show that the regret theory and CFM are applicable to the context of the COVID-19 pandemic. Notably, the statistically acknowledged indirect path and unacknowledged (aka non-significant) direct path form the indirect-only mediation effect of COVID-19 vaccine information acquisition on vaccination intention (Zhao et al., 2010; Jiang et al., 2021). Specifically, it was found that anticipated regret and collective responsibility mediated the distal relationships between COVID-19 vaccine information seeking, discussing, and vaccination intention. The more people seek or discuss COVID-19 vaccine-related information, the more likely they would show greater anticipated inaction regret and perceive higher levels of collective responsibility which, in turn, result in stronger COVID-19 vaccination intention.

Theoretical implications

The findings have several theoretical implications. First, inspired by the existing literature that has documented the robust salutary effects of health-related information on behavioral outcomes (e.g., Longo, 2005), the present research examined the effects of COVID-19

vaccine information seeking, scanning, and discussing on vaccination intention. Findings from this study extended the scope of information-processing models and expanded the purview of our understanding of health information in influencing health behaviors. Respondents were exposed to a considerable amount of information related to the COVID-19 vaccine, from a variety of media, either with purposeful efforts or without engaging in goal-directed searches to obtain that information (Liu & Huang, 2020). Despite that COVID-19 vaccine information scanning is more common than seeking and discussing, the findings of this study suggested that, for the general population, happenstance encounters with COVID-19 vaccine information do not necessarily boost intentions to get vaccinated. We speculate that it could be that people who receive COVID-19 vaccine information accidentally in a daily routine, as is the case with information scanning, involve fewer efforts in elaboration and calculation (Niederdeppe et al., 2007; Shim et al., 2006). One important route of communication persuasion is based on a person's careful and thoughtful consideration of the merits and drawbacks of the information (Petty & Cacioppo, 1986). This argument is supported by the elaboration likelihood model (Petty et al., 1988; Petty & Cacioppo, 1986), which explicates that the preconditions of attitudinal and behavioral change toward certain recommendations include people's scrutinization and elaboration upon the information based upon their analyses (e.g., the gain and loss analysis). In comparison, information seeking and discussing involves more issue-related elaboration. As expected, active COVID-19 vaccine information seeking and interactive information discussing contribute to stronger vaccination intention. Active information seekers who are searching for specific types of COVID-19 vaccine information (e.g., safety and efficacy) might have relatively well-formed perceptions about the necessity of collective action on immunization. Whilst, COVID-19 vaccine information discussing is also important to provoke anticipated regret as individuals realize

that they are part of the community and they are responsible to ensure community safety during the pandemic (Ford & Kaphingst, 2009).

Second, the findings of this study are also congruent with the theoretical assumptions of the regret theory and CFM, both of which postulates decision-making depends on cost-benefit analysis, emotional involvement, and cognitive engagement (Leventhal, 1970; Zeelenberg, 1999). This helps explain that information scanning, as a less purposeful way for information acquisition, fails to evoke anticipated regret, increase the perception of collective responsibility, and prompt people to get vaccinated. This research accounts for the affective-cognitive mechanisms in the relationship between two types of active COVID-19 vaccine information acquisition behavior – seeking and discussing – and vaccination intention. Decision-making about COVID-19 immunization, cannot be fully understood or explained without analyzing how people process information. Through exploring the mediation effects, the findings bridged the disjoined literature on information acquisition, anticipated regret, collective responsibility, and vaccination intention. Drawing from the regret theory and the CFM (Janis & Mann, 1977; Nabi, 2002; Zeelenberg, 1999), this research theoretically explicated how anticipated regret and the perception of collective responsibility could effectively mediate the relationship between COVID-19 vaccine information acquisition and vaccination intention. Particularly, our findings reveal the serial mediation mechanism that leads to vaccination intention, based on CFM. This finding is consistent with several conceptualizations in the existing literature, such as the risk-as-feeling hypothesis (Loewenstein et al., 2001) and the affect heuristic (Finucane et al., 2000), which support that through information seeking and discussing, the representation of COVID-19 pandemic in our minds is inextricably related to intuitive feelings and emotions that permeate subsequently cognitive judgements and behavioral responses. Active COVID-19 vaccine information seekers or discussants who were well-informed with the adverse health and

social consequences of COVID-19 infection, as well as benefits of immunisation would develop anticipated inaction regret as they can foresee the detrimental outcomes of vaccine refusal. For example, they may be severely affected and put their acquaintances in danger. The anticipated regret would further elicit specific cognitive appraisals about the event (Lerner et al, 2003). To reduce anticipated regret, individuals are motivated to evaluate the situation and the cognitive appraisal would further influence the attribution of responsibility in fighting against the disease. Knowing that herd immunity occurs when a critical mass of people are immunized, a cognitive perception of collective responsibility was formed, which can effectuate the mass coordination and prompt vaccination intention.

The findings of this study emphasize the importance of relying on affective feelings and cognitive perceptions in changing people's behaviors. In the context of coping with emerging contagious diseases, as people obtain related information and develop a better understanding of the severity of COVID-19 infections and the benefit of immunization, anticipated inaction regret and the perception of collective responsibility play a robust and stable role in translating the indirect effect of COVID-19 vaccine information acquisition on vaccination intention. Also plausible is that the collectivistic culture in China supports massive social coordination (Logan & Barbara, 2020). COVID-19 information on Chinese media is often framed with tremendous social efforts in combating the disease and unremitting efforts that the government has made to develop COVID-19 vaccines. As such, people in the collectivist society are expected to perceive greater anticipated regret and responsibility for actions (e.g., vaccine refusal) that deviate from the norm of default options (Simonson, 1992).

Practical implications

First, different forms of information acquisition appear to function differently. The more active or more interactive forms, namely information seeking or discussing, showed

stronger influences than the more passive form, namely information scanning, regarding COVID-19 vaccination. Health organizations may need to interpret and strategize about these forms differently, and education programs may consider more emphases on interactive information and word-of-mouth communication.

Second, although the effects of information scanning on the mediating and dependent variables failed to pass the statistical threshold of $p < .05$, two of the three paths were far from zero. The *p* test results, therefore, must not be over-interpreted – they do not suggest that information scanning is irrelevant or unimportant. Given the strong correlations between the three forms of information acquisition, which also manifest in this study, future research may investigate the possibility that scanning inspires seeking, which encourages discussing, thereby expanding the information portfolio and improving the choice architecture, which may "nudge" healthier behaviors, as nudge theory might suggest.

Third, the findings of this study suggest that anticipated regret and the perception of collective responsibility would increase vaccination intention. Practitioners may pay more attention to the role of regret during infectious disease outbreaks. For instance, they can use fear appeals to raise awareness of the threat of COVID-19 infections. Besides, in parallel with providing information to motivate the public's willingness and beliefs associated with immunization, it is equally important to provide information about vaccination instructions, such as how to find the nearest location for vaccination and how to schedule an appointment.

Fourth, it must be realized that individuals and the whole society are responsible for combating a pandemic. Government, enterprises, communities, and individuals play the respective roles to overcome the COVID-19 crisis. For example, the government should guarantee the supply of COVID-19 vaccines, medical mask manufacturing companies should produce sufficient high-quality masks, and individuals are responsible to engage in preventive behaviors that include getting vaccinated. Thus, information about collective

efforts endeavored by different agencies should be continuously disseminated to strengthen people's perception of collective responsibility to fight against the disease.

Limitations and directions for future research

With respect to the application of the findings, several limitations of this study should be noted. First, the study was conducted in China, and whether the same mediating effects would be found in other sociocultural societies is not warranted. For instance, in individualistic countries (e.g., the United States), collective responsibility might not be a salient factor that mediates the relationship between COVID-19 vaccine information acquisition and vaccination intention. Future research should further test the model in other countries and consider additional contextual factors. Second, the cross-sectional research design might preclude an assessment of causality between COVID-19 vaccine information acquisition, anticipated regret, collective responsibility, and vaccination intention. Future research can use experimental methods or collect panel data to better understand the relationships. Third, COVID-19 vaccination information acquisition behaviors were measured by investigating the extent to which participants seek, scan, and discuss the information. There remains a paucity of knowledge about what types of COVID-19 vaccine information people obtained from a variety of media channels, and how different vaccine information might exert influence on vaccination intention differently. Future research should fill this research gap by investigating different types of vaccine information and their influence. Fourth, this study examined anticipated regret and collective responsibility as the mediators in the relationship between COVID-19 vaccine information acquisition and vaccination intention, and we might neglect the impact of other moderators and mediators. For instance, collectivism and individualism as personal traits may play a moderating role. Scholars should continue to explore the mediating and moderating mechanisms to better understand the influence of information acquisition on vaccination intention. Fifth, sampling

bias might occur given that this study used an online survey. For instance, less-educated individuals and old people might be less likely to have Internet access and respond to online questionnaires. Therefore, the results of this study are not generalizable to all pullulations in China. Scholars should use probability sampling techniques to create a sample that is truly representative of the population.

Conclusion

The present study represents an initial effort to examine different information acquisition behaviors in influencing vaccination intention from an affective-cognitive perspective. Particularly in the face of a newly emerging infectious disease, evidence generated from this study showed that anticipated regret and collective responsibility mediated the relationship between COVID-19 vaccine information seeking, discussing, and vaccination intention. The findings have important implications for research on public health education and health intervention designs.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Figure 1
Theoretical framework

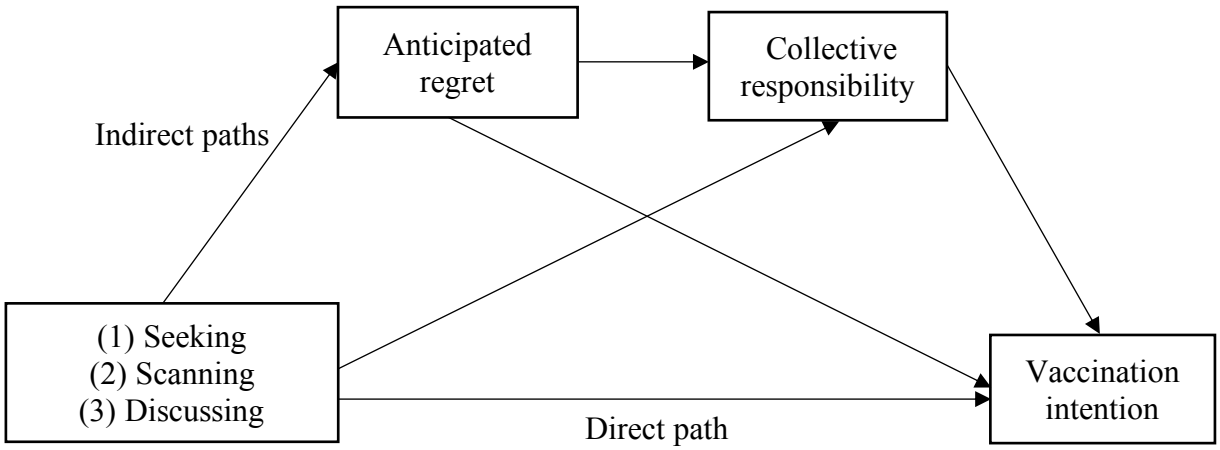


Figure 2
Information acquisition through confirmative factor analysis

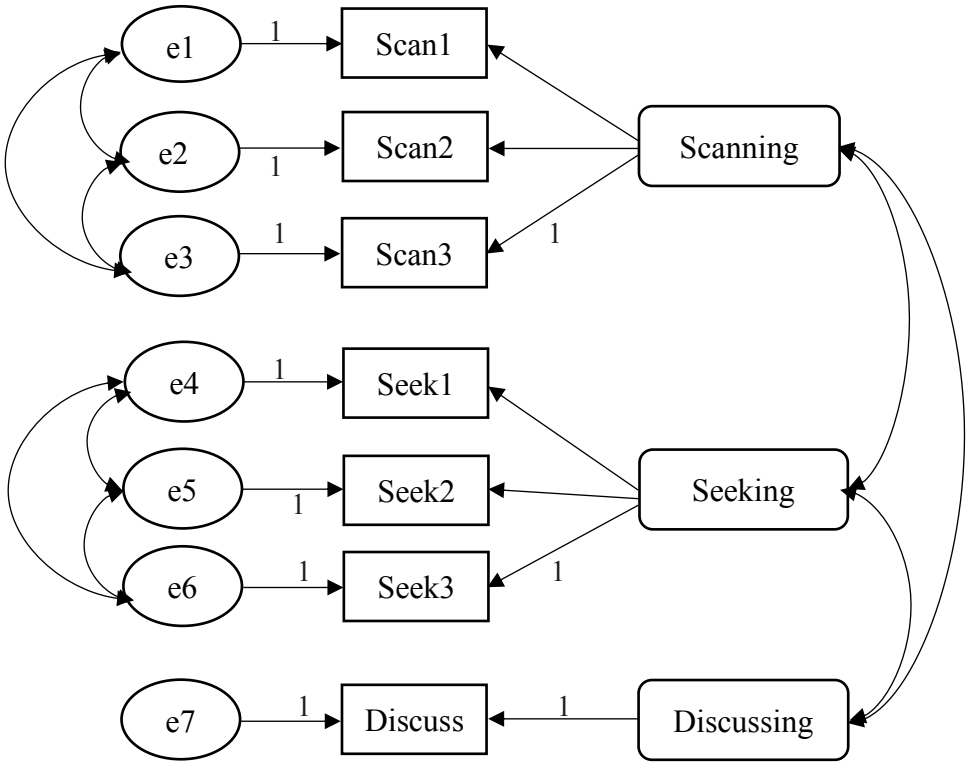
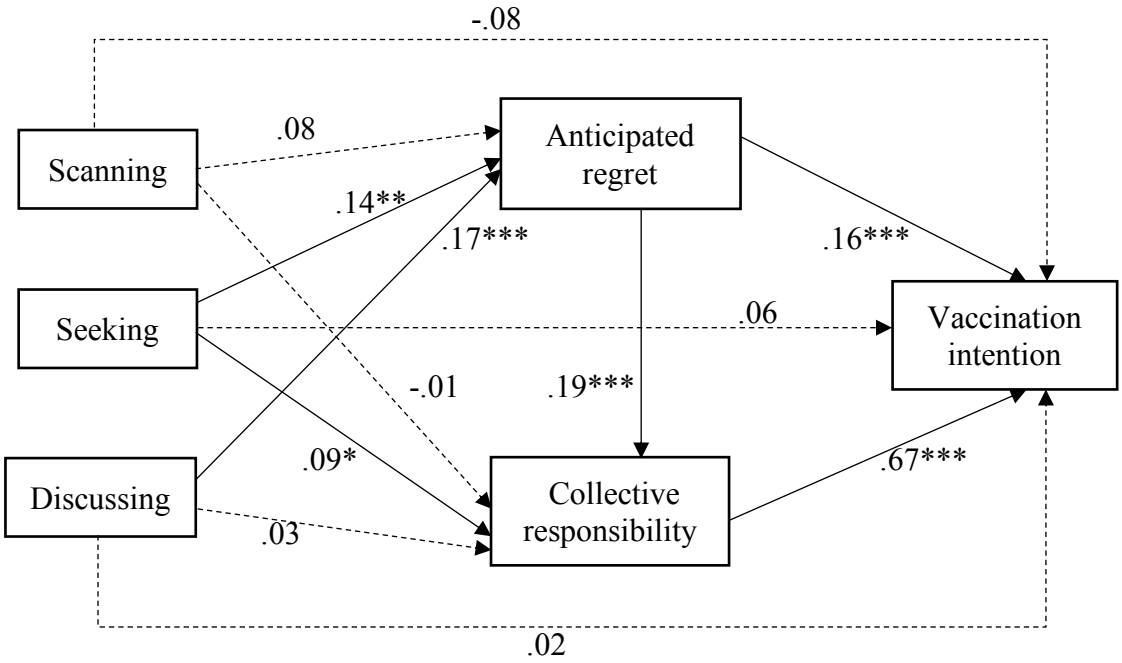


Figure 3
SEM test results



Note. For efficiency and clarity, control variables are not shown. Solid lines indicate statistically acknowledged paths ($p < .05$), and dotted lines indicate statistically unacknowledged paths ($p \geq .05$). * $p < .05$, ** $p < .01$, *** $p < .001$. Model fit indices: χ^2 *df* (5, N = 438) = 13.409, *p* = .020, CFI = .994, RMSEA = .06, SRMR = .002, and TLI = .953.

Table 1

Zero order correlation between key variables

	Alpha	Mean	2	3	4	5	6
1 Seeking	.93	2.71	.66***	.68***	.29***	.16**	.34***
2 Scanning	.86	3.53		.70***	.17***	.13*	.15**
3 Discussing		3.50			.30***	.17**	.23***
4 Anticipated regret		4.46				.24***	.37***
5 Collective responsibility	.67	3.61					.53***
6 Vaccination intention	.96	3.84					

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 2
Mediation paths

	β	SE	z-value	*p*
Scanning→AR→Vaccination intention	-.01	.01	-1.29	.196
Scanning→CR→Vaccination intention	<-.01	.03	-.019	.853
Scanning→AR→CR→Vaccination intention	-.01	<.01	-1.47	.141
Seeking→AR→Vaccination intention	.02	.01	1.74	.081
Seeking→CR→Vaccination intention	.05	.03	1.90	.047
Seeking→AR→CR→Vaccination intention	.02	.01	1.96	.044
Discussing→AR→Vaccination intention	.03	.01	1.89	.049
Discussing→CR→Vaccination intention	.03	.03	0.75	.454
Discussing→AR→CR→Vaccination intention	.02	.01	2.64	.008

Note. CI: Confidence interval; AR: Anticipated regret; CR: Collective responsibility; Covariates: gender, age, education, income and risk perception.